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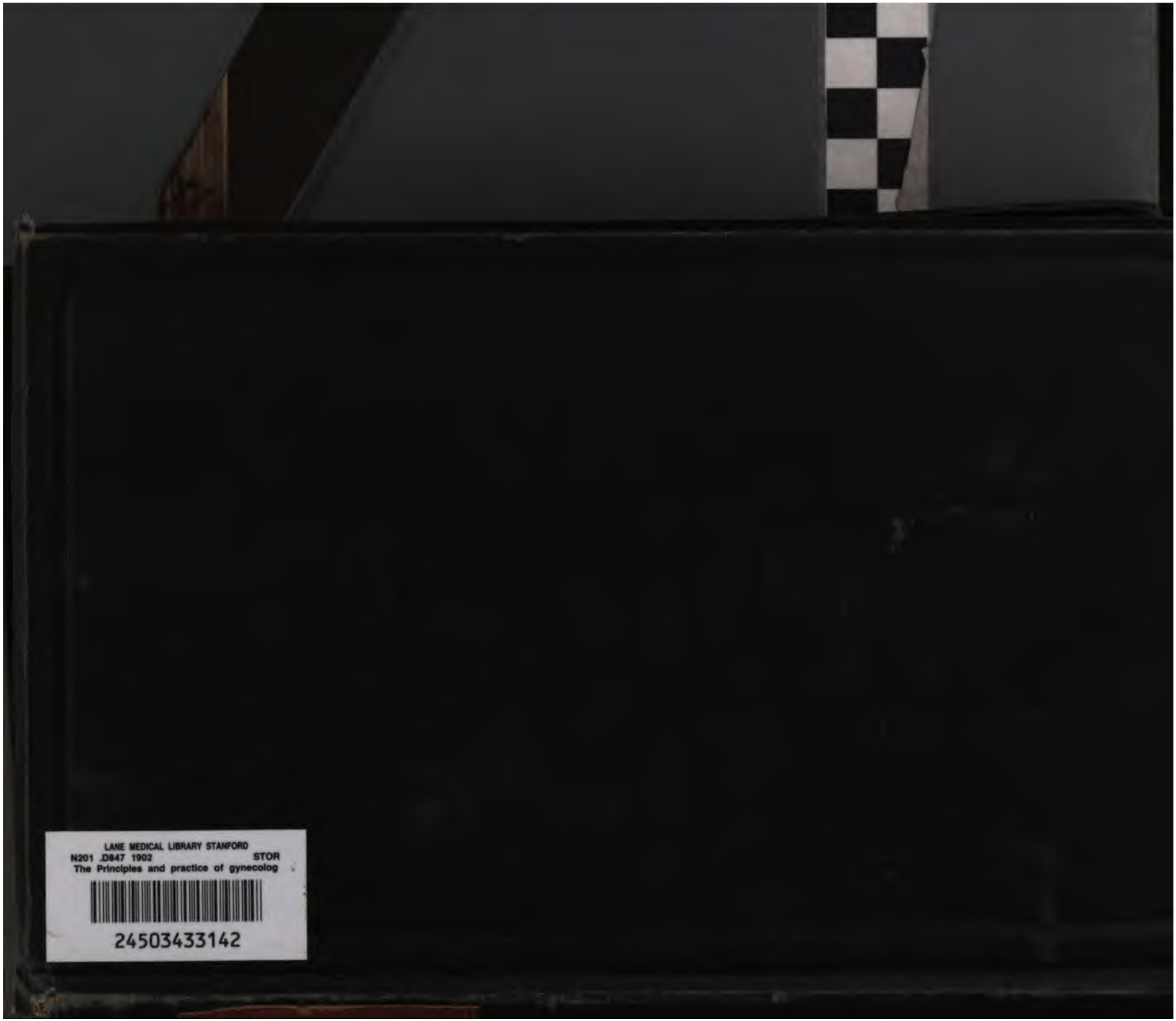
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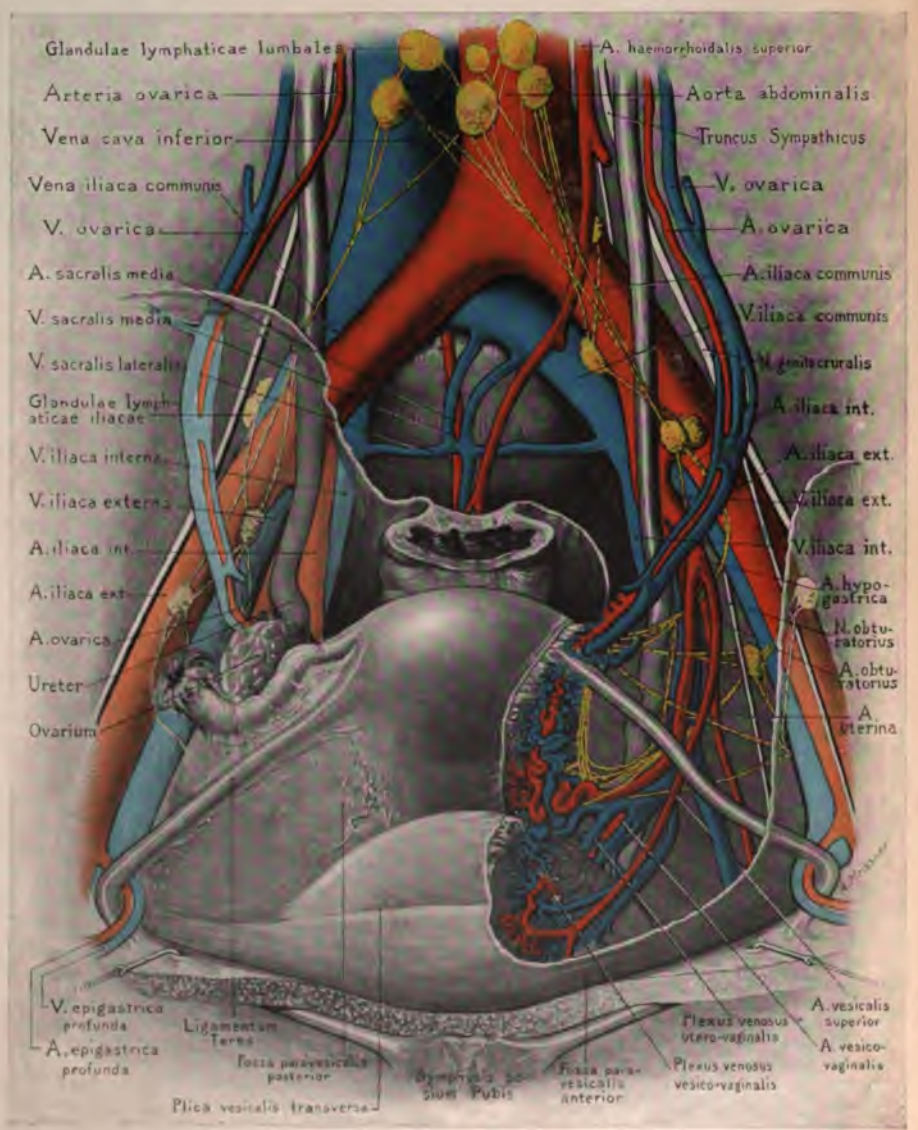

A STUDY FROM NUMEROUS ANATOMICAL DISSECTIONS AND PLATES.

THE

PRINCIPLES AND PRACTICE

OF

GYNECOLOGY.

FOR

STUDENTS AND PRACTITIONERS.

BY

E. C. DUDLEY, A. M., M. D.,

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THIRD EDITION, REVISED AND ENLARGED.

WITH 474 ILLUSTRATIONS, OF WHICH 60 ARE IN COLORS AND 22 FULL-PAGE PLATES IN COLORS AND MONOCHROME.

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IT HAS BEEN THE AUTHOR'S AIM TO BE A WORTHY PUPIL

OF

THOMAS ADDIS EMMET,

TO WHOM

THIS BOOK IS AFFECTIONATELY DEDICATED.

"THIS subject of man's body is of all other things in nature most susceptible of remedy; but then that remedy is most susceptible of error. For the same subtility of the subject doth cause large possibility and easy failing; and therefore the inquiry ought to be the more exact."

FRANCIS BACON, in the *Second Book of the Proficience and Advancement of Learning.*

PREFACE TO THE THIRD EDITION.

BEFORE taking up what has been done in this revision, it may be well to state the plan and scope of the book as explained in the prefaces to the first two editions. My purpose was to write a practical treatise on gynecology, and, in doing so, to preserve, so far as possible, the unity of each pathological process as it may affect consecutively the different pelvic organs, by a division of subjects, especially inflammations, not on the basis of the usual chapters, each describing the diverse diseases of a special organ, but rather by a division made from the standpoint of pathological and etiological sequence. The student, it was thought, would have a more rational and more comprehensive idea, for instance, of metritis by associating it closely with vulvovaginitis, salpingitis, ovaritis, and peritonitis, than by regarding it as an independent lesion. If, on the other hand, he considered all the diseases of the uterus in one part, he would find tumors, traumatisms, and other diseases thrown in between uterine infection and casual or resultant infections in other parts of the pelvis, and thus might lose sight of a most instructive relationship. Under the plan of this book he would recognize more easily and emphasize more properly the functional unity of all the reproductive organs; would study the various pelvic disorders in the combined forms which they ordinarily assume; and would grasp therefore more readily the significance of morbid processes and the relations of these processes to one another. In connection with this general plan of grouping the subjects on pathological lines my further purpose was to exclude whatever was not based upon pathology or carefully observed experience; to set forth from what was known such definite material as would be of greatest immediate help to the student and practitioner; and, as an essential part of this material, to bring out in practical form not only the principles and technique of the major operations on the peritoneal side, but as well the plastic and other minor operations on the vaginal side of the pelvic floor. In the discussion of plastic operations I have made no attempt to describe, either in the first or in subsequent editions, the great number of confusing operations on the perineum, vagina, and cervix uteri, some of which would seem to have been proposed as an

95441

improvement on nature; nor have I felt justified in presenting all of the ingenious and complicated instruments used in performing these operations, but have emphasized rather the importance of restoring the conditions of nature, which may be done with few and simple instruments, as we were taught by the pioneer gynecologists of America.

In this edition I have endeavored to make a thoroughgoing revision which should include the recent advances in gynecology, and in doing so have rewritten, rearranged, and condensed many chapters, and in this way have found space for the equivalent of about one hundred pages of new matter, without enlarging the volume to an inconvenient size. The parts relating to the Anatomy of Menstruation, Endocervicitis, Endometritis, Chronic Metritis, Pelvic Cellulitis, Perimetritis, Salpingitis, the Treatment of Pelvic Inflammations, Uterine Myoma, Uterine Carcinoma, Hystero-myomectomy, Hysterectomy, [illegible] and Parovarian Cysts, Ovariotomy, Tubal Pregnancy, Uterine Fistulæ, and Malpositions of the Uterus, to a great extent, [illegible] been rewritten. The substance of the chapters on Myometritis; [illegible] Diagnosis, and Prognosis of Pelvic Inflammations; Be[illegible]ma, and Massage, has been recast and transferred to other [illegible].

[illegible] proposed feature of the revision will be found in the method [illegible] Etiology, Pathology, Symptomatology, Physical Signs, [illegible] and Differential Diagnosis. These subjects throughout [illegible] been taken out of the paragraph form, rewritten, and [illegible] additions rearranged in tables and parallel columns. [illegible] the introduction of the maximum material in [illegible] and is designed to make the book more useful [illegible] work, and more available to practitioners, for [illegible].

[illegible] largely from original drawings were used [illegible] additions in order to give brevity to the text [illegible] distinctions with clearness and force. As, [illegible] illustrations have become obsolete, they have [illegible]. But what is more important than this, [illegible] manipulations and most of the major and [illegible] illustrated with new drawings, to show [illegible] place step by step. For example, [illegible] myomectomy are shown in twelve [illegible] drawings; Vaginal Hysterectomy, [illegible] eight drawings; Curettage, in

I desire to express my thanks to Dr. Palmer Findley, who has furnished a large amount of pathological material and has rendered valuable assistance in the preparation of the tables and parallel columns, especially those relating to diagnosis and differential diagnosis; to Dr. Robert Gillmore, who, in using the book for recitation work, has made a critical study of it and has suggested numerous verbal changes; to the publishers, who have co-operated with me in introducing an unusual number of new illustrations, including a very liberal proportion of full-page plates in colors and monochrome.

E. C. D.

1617 Indiana Avenue, Chicago,
June, 1902.

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PART I.

GENERAL PRINCIPLES.

CHAPTER I.

THE PHYSIOLOGICAL PERIODS IN THE LIFE OF WOMAN.

THE word gynecology, which in the etymological significance means the science of woman, is used always in a restricted sense to describe the diseases peculiar to the reproductive organs of woman. The analogous word, anthropology, meaning the science of man, is used always in the broadest and most generic sense to comprehend all that belongs to the human species. Gynecology, therefore, is a subdivision of anthropology.

PHYSIOLOGICAL PERIODS.

The life of woman may be divided into five periods, each corresponding to a special phase of her sexual existence; they are infancy, puberty, maturity, the menopause, and senility.

The development from infancy to maturity and the decline from maturity to senility are common alike to man and to woman. In man the anatomical and physiological changes from the time of birth to the period of youth and virility and the cessation of sexual power in old age are gradual and even processes, free from special outlay of energy, unmarked by critical periods, and uncomplicated by nervous or mental disturbance. In woman these transition-periods are characterized by great expenditure of energy, by rapid sexual change, and by distinct nervous and psychic phenomena; they are the critical turning-points in her life. At the first crisis the reproductive organs, more complicated than those of the male and hitherto inactive, suddenly become the centre of great and rapid development; from this period forward until the second and final crisis her vital forces are especially subject to the exactions of menstruation and maternity. In embryonic life and early infancy the physiological lines that mark the distinction of sex coincide, so that anatomical differences have a potential significance only;[1] as childhood recedes these lines diverge; as maturity progresses they are wider and wider apart; finally, in old age they draw together until in the second childhood, as in the first, they again coincide.

[1] Edward H. Clark. Sex in Education.

Infancy.

Infancy includes the first ten or twelve years of life, and, although a period of great pathological significance, is rather a subject of pædiatrics than of gynecology. During this period the reproductive organs are, for the most part, functionally dormant; they are undergoing a gradual development preparatory to the more rapid and radical changes of puberty. Infections and inflammations occasionally arise; neoplasms and traumatisms are rare; congenital malformations, if present, are usually overlooked until the period of puberty or maturity, when, by reason of some defect in the function of menstruation, coitus, or parturition, they become evident; displacements of the infantile uterus, although possible, have little or no clinical significance.

Puberty.

Puberty is the critical transition-period in which the child becomes the woman. The relations and influences of this period are fundamental, both in the reproductive organs and in the entire woman, so that upon the normal course of it depends much of the after health, comfort, and usefulness of the individual.

The Anatomical Basis of puberty is the full physical development of the reproductive organs. The infantile uterus is small, soft, and plastic; it varies in size from that of early infancy (Figure 1) to

Figure 1.

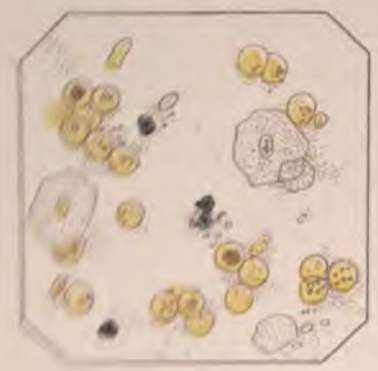
Uterus, Fallopian tubes, and ovaries of an infant one month old. Natural size.

hat of the child-uterus just before puberty; at the beginning of puberty the uterine canal would measure, perhaps, two inches; when fully developed at the end of puberty the length is two and one-half inches.

The cervix of the infantile uterus is two-thirds, and the corpus one-third, as long as the entire organ. These proportions when the organ is fully developed at the end of puberty are reversed—that is, the corpus represents two-thirds and the cervix only one-third of the

PLATE II.[1]

Figure 1.



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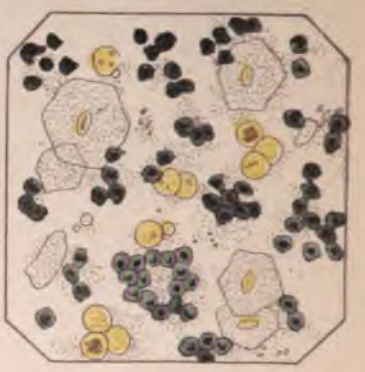

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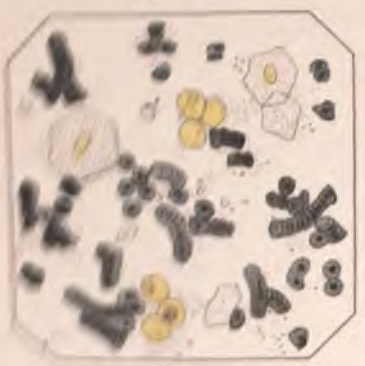

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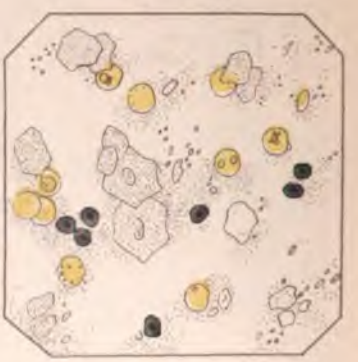


Figure 5.

Figure 6.

Figure 7.

Corpuscular and Epithelial Elements and Debris Contained in Menstrual Fluid.

Figures 1, 2, 3, 4. Microscopic view of fluid at different periods of menstruation.
Figures 5, 6, 7. Fragments of endometrium cast off ten days after menstruation.

[1] After Pouchet.

length of the mature uterus. At maturity the longitudinal axis extending from the os externum to the fundus measures three inches; the transverse axis of the corpus uteri measured laterally from horn to horn is two inches, and measured by the longest antero-posterior diameter is one inch. The fundus of the infant uterus is flat; the fundus of the mature uterus is convex and dome-shaped. The mucosa of the infantile uterus presents an *arbor vitæ* arrangement throughout the corpus and cervix; at maturity this arrangement is confined to the cervix.

Developmental changes similar to those above outlined occur in the ovaries and in the other genital organs. Puberty is marked also by enlargement of the pelvis and breasts, by the appearance of hair on the mons veneris, vulva, and armpits, by a general rounding of the form with adipose tissue, and by notable psychic changes.

The Physiological Features of puberty are the appearance of menstruation and ovulation; they indicate that the sexual nervous organization is approaching that maturity which renders the woman capable of procreation.

MENSTRUATION.

Menstruation is characterized by a bloody, mucous discharge from the uterus; this discharge contains epithelial cells from the uterus and vagina; it begins with puberty, and, unless interrupted by utero-gestation and lactation or by disease, normally recurs in regular periods until the time of the menopause. The phenomena of menstruation are both general and local.

I. **The General Phenomena of Menstruation** are as follows:

1. Slight elevation of pulse-rate and temperature at the onset.
2. Tendency to slight physical depression and inactivity.
3. Sensations of heat and cold.
4. Swelling of the breasts and thyroid gland.
5. Discomfort and throbbing in the head, weight in the pelvis and back, and irritability in the bladder.

These disturbances are subject to wide variations. In some cases they are absent; in others they are so slight as almost to escape notice, or so severe as to render life miserable and useless. Painful menstruation — that is, dysmenorrhœa — is always proof of some pathological condition. See Chapter LIII.

II. **The Local Phenomena of Menstruation** are recognized in three stages:

1. Stage of invasion — discharge of mucus.
2. Stage of persistence — flow of blood.
3. Stage of decline — discharge of mucus.

The discharge of mucus before and after the flow of blood is an essential part of the menstrual flux; in lower animals the menstrual discharge is entirely of mucus. In the human race the lower the intellectual scale the greater the quantity of mucus; the higher the scale the greater the quantity of blood.

Amenorrhœa. Amenorrhœa is the absence of menstruation; it may be physiological or pathological.

Physiological Amenorrhœa. Physiological absence of menstruation occurs:

1. Prior to puberty.
2. At irregular intermenstrual periods during the establishment of puberty.
3. During pregnancy and lactation.
4. At irregular intermenstrual periods during the climacteric.
5. After the menopause.

Pathological Amenorrhœa. A discussion of the pathological causes of amenorrhœa may be found in Chapter LI.

Age of First Menstruation. The age at which menstruation first appears varies widely with individuals. Climate and heredity, especially the former, are determining factors. In the United States it first appears on the average about the fourteenth or fifteenth year, sometimes as early as the ninth or tenth, and occasionally not until after the eighteenth. In very cold climates the average is sixteen, and in the tropics nine years.

Precocious, Protracted, and **Scanty Menstruation** will be presented in Chapters L. and LI.

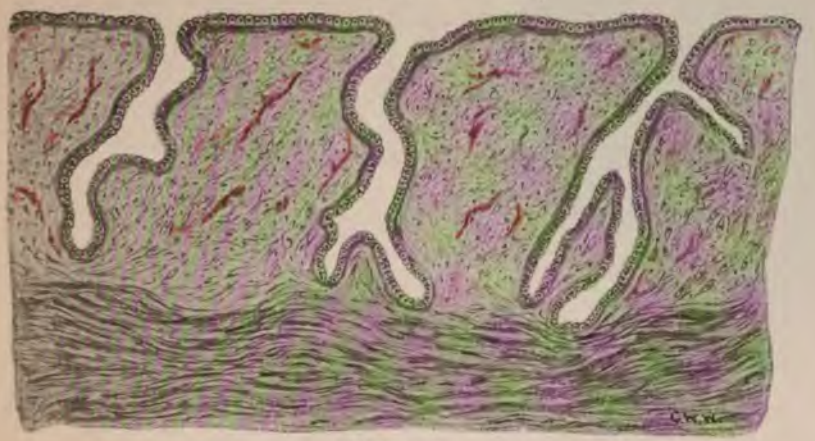
Frequency of Menstruation and Duration of Flow. The human menstrual cycle covers a period of about twenty-eight days. Variations of one or more days are common and usually harmless.

Quantity of Menstrual Discharge. The average amount of menstrual fluid lost in a single period is estimated at from six to eight ounces; the minimum is two, and the maximum, ten ounces. A plethoric, well-nourished woman may menstruate freely for eight or ten days without ill effect, and may lose an amount of blood which would seriously undermine the strength of an anæmic, poorly nourished woman. What would be normal for one woman, therefore, would be abnormal for another. The usual means of estimating the quantity of blood lost is by counting the napkins used. The average number is fourteen. Nothing approaching exactness is gained by this method, because napkins vary in size and capacity for absorption, and because one woman will tolerate an over-saturated napkin while another will scarcely permit the soiling.

Anatomy of Menstruation. Although menstruation has been the object of many strange superstitions and speculations, yet nothing is known of the utility, cause, or significance of it. Numerous conflicting opinion concerning the anatomy of menstruation have been put forth: one, that the corporeal mucosa is stripped off clear to the muscular layer at each recurring flow; another, that only the epithelial layer is shed; another, that a newly organized tissue is developed during the intermenstrual period, and that this alone is cast off. The notion that the surface epithelium is thrown off in the process of menstruation has arisen from faulty methods of investigation. Observations made on the uteri of women who had died during menstruation, from freezing or from infectious disease, or upon uteri removed twenty-four hours or more after death; or upon freshly removed specimens in which the surface epithelium had been injured in the handling, have supported the conclusion that the surface epithe-

PLATE III.

Figure 1.



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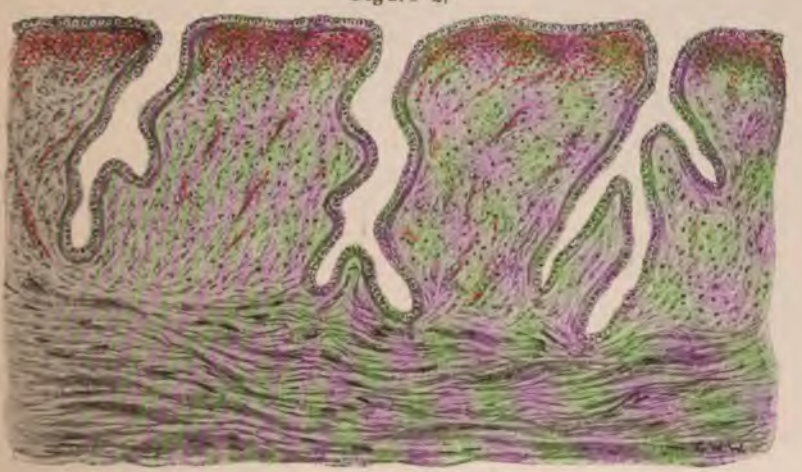

Figure 3.

Anatomy of Menstruation, modified from Gebhard.

Figure 1. Stage of pre-menstrual congestion.
Figure 2. Stage of sub-epithelial hæmatoma.
Figure 3. Stage of bursting through the surface epithelium.

lium is shed during menstruation, when in reality the loss of epithelium was post mortem. Gebhard, of Berlin, has put forth the correct interpretation of the anatomical changes of menstruation. His observations upon fresh material carefully prepared demonstrate that in menstruation *there is no shedding of the surface epithelium.* Three stages of menstruation are recognized:

1. Premenstrual congestion. Plate II., Figure 1.
2. Subepithelial hæmatoma. Plate II., Figure 2.
3. Bursting of blood through surface epithelium and post-menstrual absorption. Plate II., Figure 3.

The connective tissue of the endometrium is of the embryonal type, and is permeated with delicate bloodvessels. These vessels participate in the general pelvic congestion that precedes menstruation, and readily give forth an effusion of blood into the embryonal connective tissue; the effused blood takes the direction of least resistance—that is, to the surface of the endometrium. Under the surface epithelium the blood collects in small quantities, forming what may be termed subepithelial hæmatomata. With increasing pressure the blood passes between the epithelial cells of the surface, elevating groups of cells from the basement membrane and occasionally breaking off small fragments of epithelium. With lessening blood-pressure the hemorrhage becomes less abundant and finally the blood ceases to pass through the epithelial barrier; then follows absorption of the effused blood from the connective tissue and subepithelial spaces. The epithelium that had been lifted from the basement membrane sinks back into its former relations. Any minute areas accidentally denuded are quickly covered by new epithelium regenerated from adjoining surface epithelium and gland epithelium. Such are the anatomical events of menstruation.

OVULATION.

Ovulation involves the maturing and rupture of the Graafian follicle and the escape of the ovum. Formerly, menstruation was commonly thought to be an external manifestation of ovulation and dependent upon it; but whatever may be the relation between these two functions, that of cause and effect, for the following reasons, is no longer tenable:

1. There is a cyclical periodicity in menstruation, and there is no such periodicity in the maturing of the Graafian follicle and discharge of the ovum; the process of ovulation is continuous, and occurs even in the mature fœtus.
2. Menstruation sometimes continues after removal of the ovaries.
3. In opening the abdominal cavity during menstruation one frequently fails to find a fresh corpus luteum in either ovary; on the contrary, he more frequently finds it during the intermenstrual period.
4. Ovulation occurs in the absence of menstruation, because conception may take place during the period of lactation, and even after the menopause.

Although the dependence of menstruation on ovulation has not

FIGURE 2.

Section of ovary[1] (magnified). Outer covering. 2. Graafian follicles in earliest stage of development. 3. Graafian follicles in more advanced stage of development; the largest of these is an almost mature follicle. 3'. Follicle from which ovum has escaped. 4. Slightly developed follicles. 5. Peripheral stroma. 6. Central stroma. 7. Corpus luteum.

been established, there is reason yet to conclude that ovulation and menstruation are both under the control of the same nerve apparatus, and that the nerves of the uterus and ovaries have a certain co-ordination.

FIGURE 3.

Development of the Graafian follicle.[2] *KE.* Germinal epithelium, from which Pflüger's tubes, *PS*, in ovarian stroma are developed. *So.* Ovarian stroma. *g, g.* Small vessels. *U, U.* Primitive ova. *S.* Space between membrana granulosa and ovum. *Lf.* Liquor folliculi. *D.* Discus proligerus. *Ei.* Ripe ovum, with germ-vesicle and (*K*) germinal spot. *Mp.* Membrana pellucida. *Tf.* Muscular sheath of follicle. *Mg.* Membrana granulosa.

Care during Puberty. Although the appearance of menstruation indicates that maternity is possible, it by no means follows that the development of the individual is complete at this time, nor that she is capable of fulfilling the requirements of maternity. Until about the twentieth year the nervous system is unequal to the strain of child-bearing and child-rearing; the muscles are inadequate to the carrying and expulsion of the child; and the pelvis is often too small to give it safe exit. The period of puberty should, therefore, be taken as extending not only over the few months required for the establishment of menstruation, but always as including the time necessary for full physical development. During this period the energy of the girl is taxed by the rapidity of sexual development, by the great liability to circulatory disturbances, by the physical and mental strain of education, and by the conventionalities of society,

[1] Modified from Schron's drawing of the ovary of a cat.

[2] Wiedersheim.

which may require injurious changes in dress and personal habits. The necessity, therefore, for great care is apparent. Nutritious and simple diet, frequent rest, moderate amusements, and adequate exercise are essential. Study, especially during menstruation, should never be pressed to the point of fatigue. Inasmuch as passional life now begins, and the whole nervous organization is therefore subject to new impulses and requirements, reading and associations should carefully be selected, and should exclude whatever may unduly excite the emotions. Errors committed now may have grave consequences,

FIGURE 4.

Mature ovary, Fallopian tube, and uterus, from a woman twenty-five years of age. Natural size.

such as malnutrition, psychoses, sterility, menstrual and other functional disorders, and may make the woman a hopeless invalid. For reasons already given, one of the most serious errors is premature marriage.

Education.—According to prevailing ideas, the higher education and civilization strongly tend to check and pervert the development of woman, to cause numerous weaknesses, to increase the burdens and dangers of maternity, and to lessen the vigor of the offspring. We are told that the republic is in danger from the deterioration of our women. The limits of this work cannot include an adequate discussion of education, nor are sufficient facts known upon which to base valid conclusions. These pessimistic forebodings, however, have

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The Menopause.

The menopause, sometimes called the climacteric, sometimes the change of life, is the second critical period. It usually occurs between the ages of forty and fifty. The occurrence of it before the fortieth or after the fifty-second year is abnormal; the duration is from three to five years. Heredity is an important factor in the time and duration of the menopause. Pathological causes more or less recognizable may shorten or lengthen it. In very cold climates both puberty and the menopause are delayed. The opposite is true in warm climates.

The Anatomical and Physiological Basis of the Menopause is atrophy and cessation of function. This critical period is characterized by the following senile changes in all the reproductive organs:

1. *Senile changes in the ovary:*
   - *a.* Atrophy, induration, and shrinkage to rudimentary size.
   - *b.* Disappearance of Graafian follicles.
   - *c.* Cessation of function.
2. *Senile changes in the Fallopian tubes:*
   - *a.* Shortening and narrowing; often complete obliteration of lumen.
   - *b.* Destruction of epithelial elements.
3. *Senile changes in the uterus:*
   - *a.* Atrophy of entire organ — shrinkage to rudimentary size; may be reduced to a hard, wedge-shaped body, one-fourth size of mature organ.
   - *b.* Muscular and glandular elements become rudimentary.
   - *c.* Canal may close at internal os, or external os, or become obliterated throughout.
   - *d.* Secretions may be locked up by adhesions — pyometra or hydrometra.
   - *e.* Vaginal portion may disappear, making the upper part of the vagina continuous with the uterine canal.
4. *Senile changes in the vagina:*
   - *a.* Shortening, narrowing, and loss of elasticity.
   - *b.* Loss of pavement epithelium and substitution of a hard surface containing more or less cicatricial tissue.
   - *c.* Contraction of introitus vaginæ.
5. *Senile changes in the vulva:*
   - *a.* Same as in vagina—great contraction and loss of elasticity.
   - *b.* Destruction or impairment of vulvo-vaginal glands and vulvar follicles.
   - *c.* Cutaneous surface dry and scaly.
   - *d.* Hair on mons veneris may turn gray.
6. *Senile changes in the mammæ:*
   - *a.* Loss of glandular elements and cessation of function.
   - *b.* Atrophy and shrinkage; sometimes the atrophic loss is made up or more than made up by the deposition of fat.

The Essential Phenomenon of the Menopause is permanent arrest of all functions peculiar to the reproductive organs. It is the inversion of the developmental process of puberty. It marks the end of active sexual life. The atrophic changes are known as senile atrophy.

The Symptoms of the Normal Menopause are referable to two stages: a stage of menstrual irregularity preceding the cessation of the menses, and a post-cessation stage of variable systemic disturbances. In normal or nearly normal cases the menstrual irregularities and the systemic disturbances are slight. The woman may at times be unusually capricious and emotional; yet she passes through this physiological crisis with only a few minor perturbations, such as the characteristic vasomotor flushes, perspiration, vertigo, somnolence, numbness, and faintness. The menstrual function ceases as it began, with marked symptoms referable to the nervous system.

Symptoms of Abnormal Menopause. Irritability, apprehensiveness, hysteria, melancholia, and other psychic disturbances, more or less exaggerated, are common in the abnormal cases. The flow may become continuous; it may become so excessive as almost to amount to dangerous hemorrhage; or life may be jeopardized by a slow, continuous drain. There is an increased tendency to malignant disease of the uterus and breasts during this period. The excessive fear of this may prey injuriously on the mind of the woman.

The menopause often cures pelvic disease; this is because pathology is physiology modified by disease, and because atrophic changes when they arrest physiological processes may also at the same time put an end to pathological processes. Especially is this true if the pathological processes have depended upon the functional activity of the organs involved. It therefore follows that a woman who has suffered for years from chronic uterine or ovarian disease may now enter upon a long period of increased vigor and robust health. It may, however, be a dangerous, even a fatal mistake to assume that the ills occurring at this time of life properly belong to the menopause; that they need give no anxiety; that they will disappear with it; and that they therefore require no attention. Although such a notion prevails, yet some of the most grave disorders of the menopause are consequent upon pathological states for which atrophy of the reproductive organs can give no relief. Continuous and excessive hemorrhages and excessive nervous disturbances are matters of specially grave solicitude, since the one may indicate malignant disease and the other may tend to mental derangement. Prompt diagnosis and energetic treatment may be imperative.

Senility.

The decline of life is normally a period of repose. The functions of the reproductive organs having ceased, the organs have little physiological significance. The special disorders and dangers of this period, such as malignant growths, senile vulvo-vaginitis, and senile endometritis, will be considered in the proper connections.

CHAPTER II.

SEPTIC INFECTION AND ASEPTIC TECHNIQUE.

THE genital tract of the new-born is sterile. In mature life the cervix and corpus uteri and Fallopian tubes, under normal conditions, are sterile. The vagina contains numerous non-pathogenic micro-organisms. See Chapter XI.

SEPTIC INFECTION.

Micro-organisms have been abundantly proved to be the cause of the septic and inflammatory diseases of women. In the examination of the vaginal secretions of nearly two hundred women Döderlein demonstrated about one-half to be abnormal. In 10 per cent. of the abnormal cases he found the streptococcus pyogenes. Inoculation experiments showed that in 50 per cent. of these the microbe was pathogenic for animals. Clivio and Monti have found the streptococcus in five cases of puerperal peritonitis. Czerniewski found it in the lochia of thirty-three out of eighty-one cases of puerperal fever, while in the lochia of fifty-seven healthy women he found it but once. In ten fatal cases he demonstrated its presence in the organs after death. The countless myriads of cocci present in a single microscopic field of fluid taken from the abdomen in a case of septic peritonitis show the developmental power of the micro-organism. For a physician to go immediately from a case of erysipelas or of streptococcus phlegmon, or of any other virulent infection, to visit other patients, even after the most painstaking disinfection, is scarcely safe. Repeated disinfection on two or three consecutive days is desirable, perhaps necessary. To go without any disinfection beyond the ordinary washing is criminal.[1]

Septic infection formerly caused an appalling mortality in the major gynecological operations and made the minor manipulations extra perilous. The fear of infection was so great that when the malady was neither fatal nor very disabling the practitioner often used temporizing measures, however unpromising, to the exclusion of surgical measures, however rational. Now the application of the aseptic principle has made all gynecological procedures relatively safe.[2]

Sepsis is the general term for all surgical infections of microbic origin. The term asepsis, with its corresponding adjective aseptic, is used to imply the absence of these infections. Sepsis is doubtless due

[1] Adapted from Robb. Aseptic Surgical Technique.

[2] For a full discussion of aseptic technique, the reader is referred to the excellent work on that subject by Hunter Robb, Professor of Gynecology in the Western Reserve University, Cleveland, Ohio, and formerly Associate in Gynecology in Johns Hopkins University, Baltimore, Md.

to the products of bacteria rather than to the bacteria themselves. Septicæmia, toxæmia, sapræmia, and pyæmia are terms used to signify different forms of infection.

The presence of infectious microbes in the circulation, together with the chemical action of their products, gives rise to the condition called *septicæmia*.

Other microbes exist locally, but may send out their products through the circulation, thereby producing *septic toxæmia*. When the toxæmia is due to the products of putrefactive bacteria it is often called *sapræmia*. When pus emboli are carried through the circulation from a focus of suppuration, to set up other foci in different portions of the body, the condition is called *pyæmia*. These terms, although widely used, are not absolutely definite. Our knowledge of the conditions which they signify is incomplete. An apprehension of their meaning, however, is essential to an appreciation of modern surgical literature.

Microbic invasion may be in the form of wound infection; it may also occur directly in the unbroken cutaneous or mucous surfaces. The micro-organisms most important and most often found in gynecology are:

The staphylococcus pyogenes aureus,	The gonococcus of Neisser,
The staphylococcus pyogenes albus,	The bacillus coli communis,
The streptococcus pyogenes,	The bacillus tuberculosis.

Numerous other microbes less common or less virulent have been omitted from this list. Among them are the bacillus of tetanus, and the bacillus of malignant œdema, both rare, non-pyogenic, and most virulent; the bacillus pyogenes fœtidus, the pneumococcus, the bacillus pyocyaneus, actinomyces, the staphylococcus epidermidis of Welch, and the bacillus aërogenes capsulatus.

Staphylococcus Pyogenes Aureus and Albus.

These are the most frequent and widely distributed, and are the most abundant sources of suppuration. Both are saprophytes—*i. e.*, they flourish on non-living matter and are cultivated readily in the various organic media. The staphylococcus aureus is found in almost all abscesses. It usually appears in groups, often in pairs of fours. In cultures open to the air it forms large, golden-yellow masses. Its pathogenic power is variable, being sometimes more virulent, sometimes less virulent. Its pyogenic properties in man have been clearly proved by the experience of Garri, who rubbed into the uninjured skin of his arm a pure culture of this organism. Four days later a large carbuncle surrounded by isolated furuncles appeared at the site of the inoculation. The inflammation ran the usual course, and it was only after several weeks that the skin healed over completely. Seventeen scars remained as a lasting proof of the success of the experiment.[1] It is the usual microbe of local suppuration, but is said to cause general septicæmia from puerperal or surgical infection. The staphylococcus albus closely resembles the aureus in form and func-

[1] Adapted from Aseptic Surgical Technique. Robb.

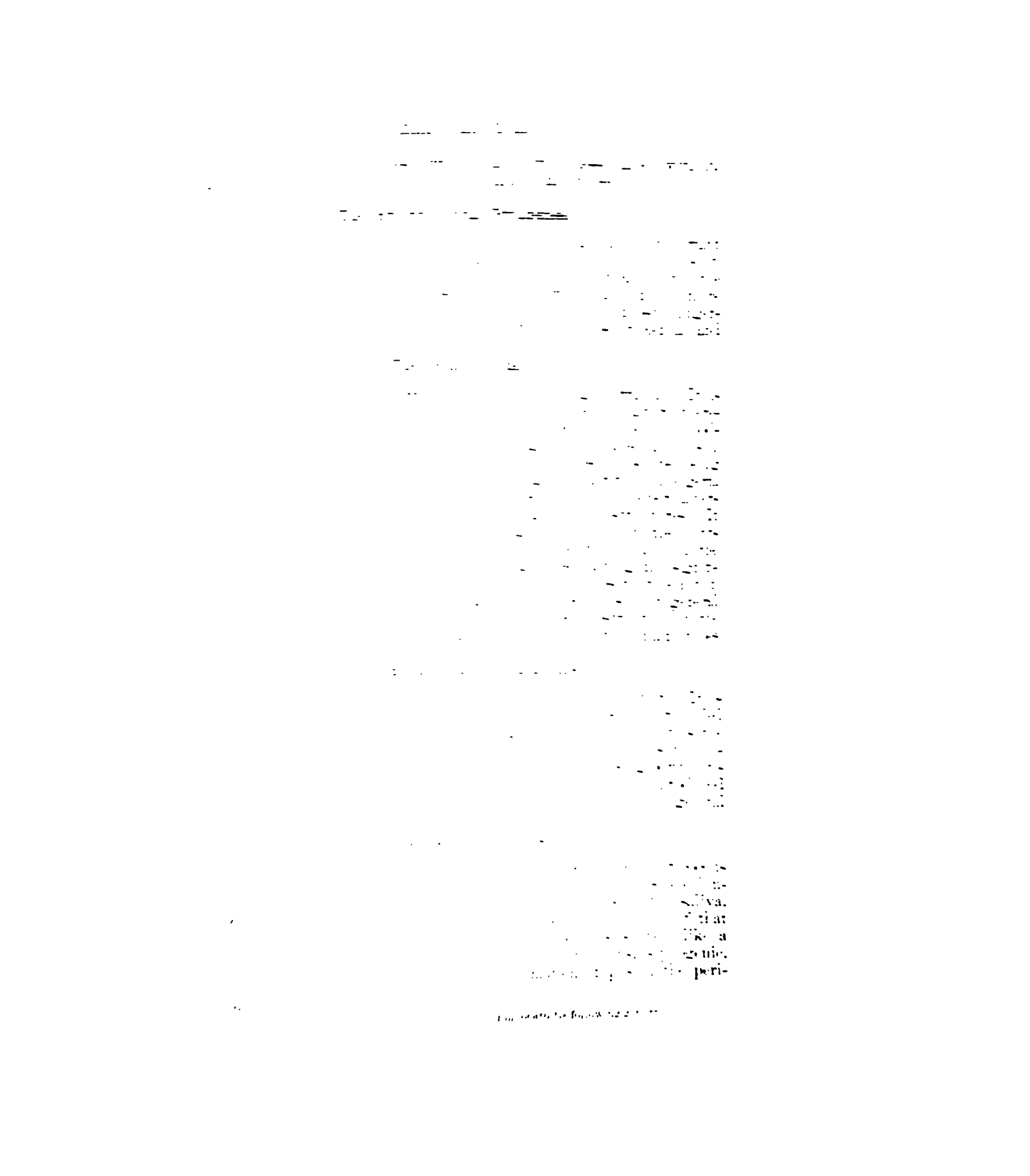
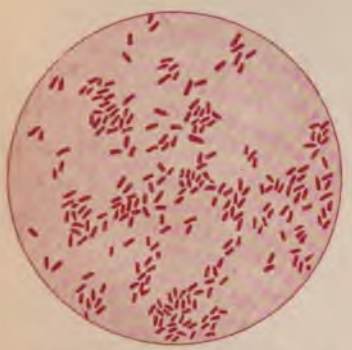
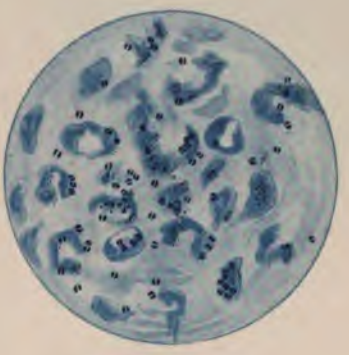


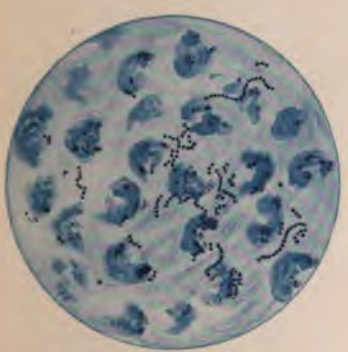
PLATE IV.



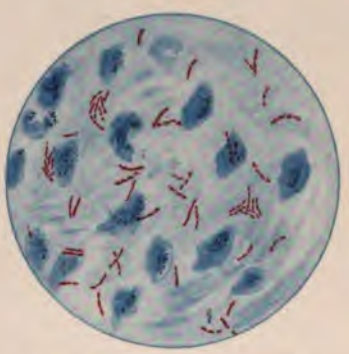
Bacillus coli communis.



Gonococcus.

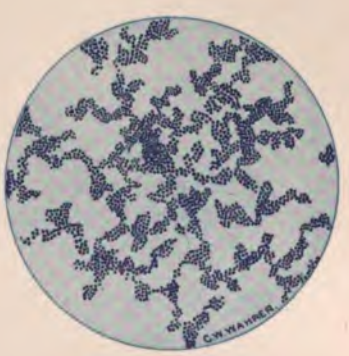


Streptococcus pyogenes.



Bacillus tuberculosis.

Pneumococcus.



Staphylococcus

Magnified 1000 times.

Bacillus Tuberculosis.

The bacillus of tuberculosis has been found in inflammations of all the genito-urinary organs, and especially in tubercular peritonitis and salpingitis. Infection from this microbe is seldom a sequence of traumatism, and it is therefore hardly to be feared as a factor in surgery. On the contrary, surgical operations are said to have a decided inhibitory effect on the progress of tubercular peritonitis, the disease having in many cases disappeared after simple exploratory incision.

ASEPTIC TECHNIQUE.

The causation and course of infection necessarily depend upon the source, virulence, and number of the organisms; upon the volume and nature of their products—that is, of the toxalbumins; and upon the local conditions. The presence of foreign bodies, of pathological secretions, of bruised, congested, or dead tissue, is favorable to infection. In the vast majority of cases infection is carried to the wound by the hand of the surgeon or his assistants or appliances; this is called *hetero-infection*. *Auto-infection*, which is supplied by organisms already existing in the patient at the time of the operation, is relatively less frequent. Some bacteria undoubtedly reach the wound through the air; but they are usually not virulent, and are therefore not dangerous. Fortunately, the fluids and living tissues of the body have germicidal power, and consequently offer a degree of resistance to bacterial invasion. Many germs, therefore, which in artificial media would flourish, may become inert when exposed to the resistance of living tissue. Since this resistance is often inadequate, it becomes necessary so far as possible to exclude the organisms from the field of operation by aseptic measures, or to destroy them by antiseptic agents. It is clearly important that the power of tissues to resist organisms be not impaired by the too free use of chemical antiseptics or mechanical agents.

The mere acceptance of the aseptic idea without a thorough and systematic application of it, not only in major operations, but even in simple manipulations, is inadequate. Efficient techniqne is the outgrowth of a comprehensive grasp and an intelligent appreciation of the causes, prevention, and remedies of septic infection. It requires, above all, the development of what has aptly been called the *aseptic conscience*.

Asepsis is the absence of infectious bacteria. Strictly speaking, this may be an ideal condition, since it is not always fully realized; but it is usually possible to limit the number of bacteria to a safe minimum, or to render them harmless by means of drugs, chemicals, and other agents. Such agents are called antiseptics. When the antiseptic has the power to destroy germs, it is often called a germicide. The use of antiseptics may be either prophylactic or therapeutic.

Asepsis involves a great number of details variable and hard to anticipate. A complete description is impossible and unnecessary. Once grasp the great principle of asepsis, and the subordinate details,

otherwise complex, become simple. The intelligent operator, for example, who knows that septic infection is the result of contact, need not be told that during an operation he must keep his hand off from whatever is not sterile. The danger of sepsis is in a measure proportionate to the length of the operation, to the exposure of the wound or cavity, and to the extent of the traumatism. It follows, therefore, that an operation should be finished as rapidly and with as little operating as possible. At the same time, the slow operator, if gentle and firm in his movements, is less dangerous than one of rapid and violent movements.

The object of the prophylactic use of antiseptics is asepsis. Before any gynecological operation or manipulation the operator's hands, the instruments and other appliances, and the field of the operation or manipulation should be rendered surgically clean and so maintained throughout the operation. The therapeutic use of antiseptics is indicated when infection has actually occurred. Then the field of infection, if local, may be opened and disinfected or drained; if the infection is systemic, the internal use of antiseptic drugs may be indicated. When there is no infection, and the use of antiseptic drugs is therefore prophylactic, they should be used but sparingly, if at all, and not in contact with the wound. This is because they have injurious properties which may give rise to dangerous, even fatal, results. The use of these drugs is to secure surgical cleanliness, as soap is used to secure aesthetic cleanliness; and, the object having been attained, they should be washed off with sterile water from the hands and instruments before these are brought in contact with the patient. *The prophylactic use of antiseptics is an antiseptic procedure to an aseptic result.*

Antiseptic Agents.

Heat, soap, carbolic acid, corrosive sublimate, and formaldehyde gas are among the most reliable and practical antiseptic agents. Heat is the most powerful and available germicide, and the most practical for sterilization of everything which it does not injure. The actual flame and hot-air sterilizer have been mostly discarded for gynecological use. Moist heat is employed in the form of boiling water or of steam.

Sterilization by Boiling. Absolute sterilization for laboratory work [illegible] boiling for thirty minutes on three consecutive days; but for [illegible] one boiling for thirty minutes is ample. In fact, [illegible] pathogenic microbes and their spores are destroyed in a [illegible].

Sterilization by Steam is efficient, available, and widely applicable. [illegible] connected with an operation that is not injured [illegible] rendered aseptic by this means. For this purpose, numerous [illegible] have been devised, that of Arnold being most [illegible] contains a chamber for the articles to be sterilized. [illegible] from this chamber and, coming in contact [illegible] instruments, towels, gowns, aprons, dressings, [illegible] them sterile, or at least practically safe for

surgical purposes, in about sixty minutes. The Boeckmann steam-sterilizer, which works by so-called "over-steam sterilization," is thought by some to be more effective than the so-called "under-steam" sterilizers of Arnold and others. This sterilizer has the advantage of not wetting the dressings so much, and is provided with means of drying them before they are taken out. The process, repeated for sixty minutes on two or three consecutive days, insures the final destruction of any spores that might otherwise survive the first trial and germinate on the next day.

Soap, although not a powerful germicide, is, perhaps, the most valuable of all antiseptics. It is used in cleansing the instruments, clothing, and other things needed in connection with operations, and for washing the skin of the patient and operator, but more especially for scrubbing the hands and arms of the surgeon and his assistant. The familiar sapo viridis, usually called green soap, is immeasurably superior to all others.

Carbolic Acid is a chemical antiseptic of great power. It also has the highest germicidal and deodorant properties, and has been more freely and generally used than any other antiseptic; but it has properties that render it dangerous for the patient and inconvenient for the operator. It corrodes instruments, injures the skin, and by its local anæsthetic properties impairs the tactile sense. The use of this drug is now limited to the disinfection of very small areas of local infection, where the quantity used is not sufficient to cause systemic poisoning, even though the acid be used in full strength. The danger of washing out septic cavities with 1, 2, 3, or 5 per cent. solutions is, generally speaking, prohibitory; for example, profound shock has repeatedly followed the introduction of weak solutions into the rectum. It is soluble in hot water to the amount of 5 per cent., and may be rendered much more soluble by the addition of 10 per cent. of glycerin.

Corrosive Sublimate, like carbolic acid, is a germicide of considerable power; but is dangerous if brought freely in contact with the patient. It may be used for disinfecting the hands after prolonged scrubbing, for the sterilization of surgical dressings, and for solutions in which ligatures and sponges may be kept. The drug, however, should be washed out of the sponges with sterilized water before they are used. Irrigation of the bladder with a solution as weak as 1 in 10,000 has been followed by most violent exfoliative cystitis. It should never be used in the urinary system.

Sodium Carbonate. Common washing-soda is an active germicide when used in a 1 per cent. solution with water, but it does not become active until the solution has been raised to the boiling-point; then sterilization is much more rapid than in plain boiling water. The boiling solution is said to dissolve the capsule of the germ and to destroy it in five minutes. This form of sterilization is suited best to instruments and other appliances that are not injured by heat.

Formaldehyde Gas is generated[1] by passing the vapor of wood-alcohol—methylic alcohol—mixed with the oxygen of the air through

[1] The generator is the invention of Mr. Bertram K. Hollister, of Chicago, and is known as Hollister's formaldehyde generator.

heated platinum gauze. The chemical change is represented by this formula :

$$CH_4O + O = CH_2O + H_2O.$$

As the wood-alcohol vapor, CH_4O, passes through the heated platinum gauze it gives up two atoms of hydrogen, which combine with an atom of oxygen from the air and form water, H_2O. There is left formaldehyde gas, CH_2O. The heat-energy of this chemical change is sufficient to maintain continuously a red heat in the platinum ; hence so long as the materials last, the process, once started, is automatic. The generator, Figure 7, holds a quart of wood-alcohol, and once

FIGURE 7.

The formaldehyde generator. There are two sizes, the larger of which is preferable.

will run continuously for twenty-four hours. When used, it the bottom of a copper sterilizer or of some other receptacle, part of which contains wire trays to hold the articles to be exposure to the formaldehyde gas. The gas, having them, is carried off by a small funnel into a chimney- out of doors.

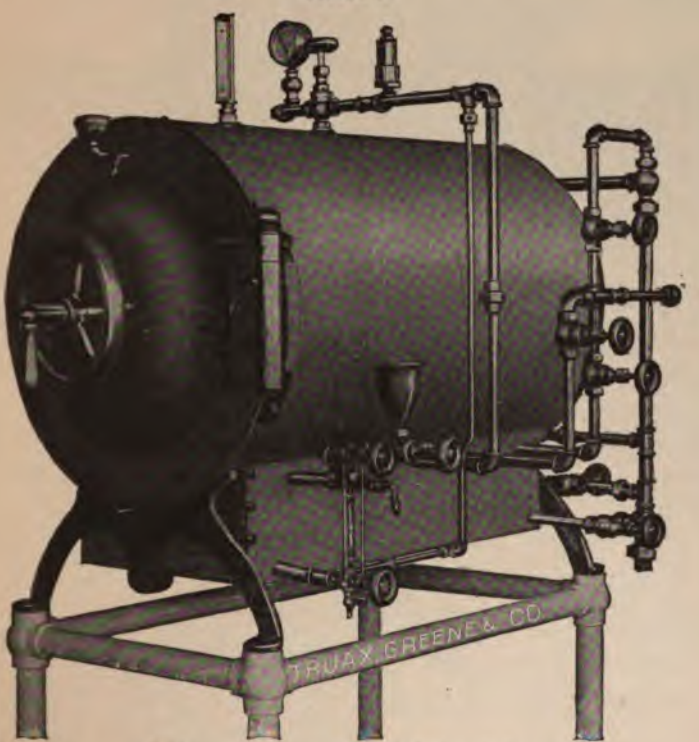
sponges, towels, instruments, and other appliances are in less than thirty minutes. It is, however, suggested that the exposure be continued for several hours. The necessity of having to carry off the gas makes the process impracticable in private houses before operations. The process is the sterilization of rooms and clothing, nor for the and cannot become so until a generator has of producing larger quantities of gas.

such as alcohol, ether, essential oils, turuseful in their places, and will be considrejected because of its poisonous properties induce prolonged nausea and vomiting.

High-pressure Steam-sterilizer for Hospital Use.

This sterilizer is almost indispensable in hospitals where it is necessary to sterilize rapidly large quantities of dressings and other appliances; but is too complicated and usually too expensive for general use in private practice; it consists of a chamber in which the articles

FIGURE 8.



High-pressure steam-sterilizer for hospital use.

to be sterilized are placed and subjected *in vacuo* to high-pressure steam. The creation of a vacuum before letting in the steam insures greater thoroughness in sterilization. This sterilizer is furnished in different sizes, the diameter varying from fourteen to eighteen inches and the length from twenty-two to thirty inches.

Instruments, Pouches, and Bags.

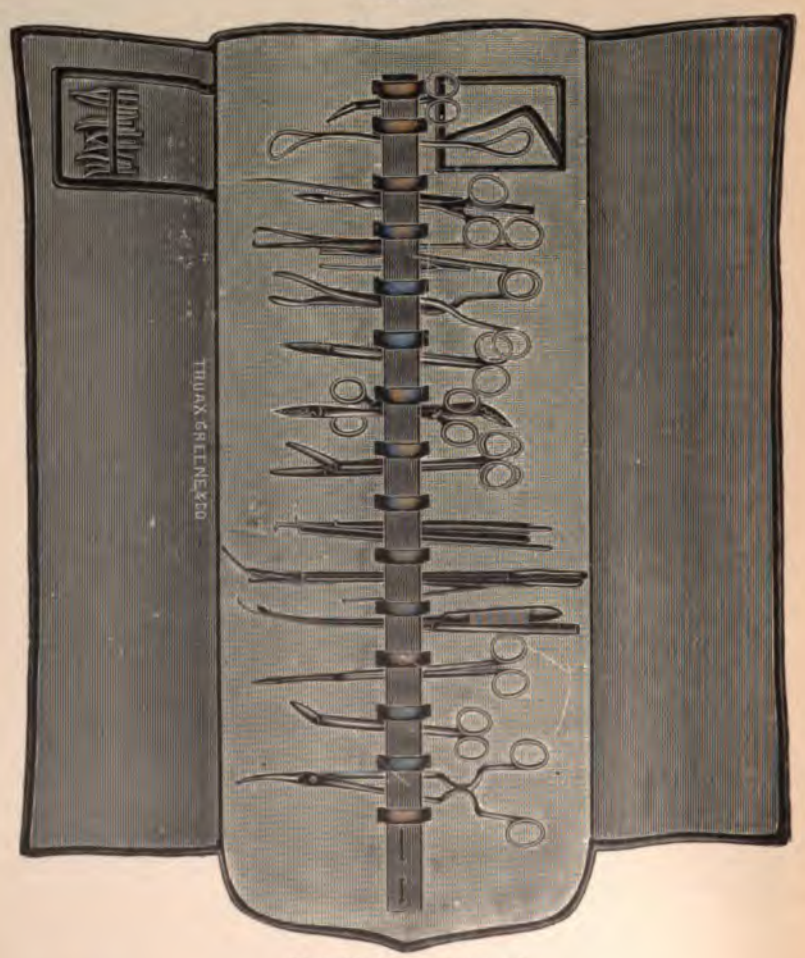
The conventional leather instrument-pouch is a prolific incubator of disease, and must, therefore, give place to the aseptic pouch of some washable fabric that may be sterilized by boiling, and changed frequently. See Figure 9.

The leather instrument-bag is certain to become unclean, and is therefore dangerous. The canvas-covered telescope valise is inexpensive, simple, and easily cleaned.

Instrument-case, Low-pressure Sterilizer, Sponge-basin, and Trays Combined, for Use in Private Practice.

The apparatus shown in Figures 10, 11, and 12 is designed to lighten the burden and add to the safety of surgical work in private houses, especially in the country. From a satisfactory experience of several years, the writer offers it in place of the septic instru-

FIGURE 9.



Washable instrument-pouch.

ment-bags, the conventional sterilizer, the cumbersome trays and sponge-basins which make up the usual impedimenta of surgical practice outside the hospitals. The apparatus fulfils the requirements, first, of an aseptic instrument-case; second, of a steam-sterilizer; third, of instrument-trays and sponge-basins. It consists of two rectangular sterilizers made of copper, nickel-plated, in which

may be packed all instruments and other appliances requisite for an abdominal section or for any other ordinary surgical operation. The component parts may further be used separately as pans, sponge-

FIGURE 10.

Instrument-pouch rolled and tied.

basins, and trays. The whole outfit, enclosed in a washable canvas cover or in a telescope valise, is sixteen inches long, nine inches wide, twelve inches high, and when packed ready for an operation weighs about twenty-five pounds. See Figure 11. This case contains a com-

FIGURE 11.

Combination instrument-case, sterilizer, sponge-basins, and trays, packed, ready to be taken to an operation.

plete set of instruments, towels, sponges, ligatures, suitings, dressings, aprons, nail-brushes, sterilized green soap, ether, chloroform, alcohol, antiseptic drugs, rubber sheet, douche-bag, etc. The equipment is adapted for work anywhere. It especially solves the problem of

aseptic surgery outside of hospitals, whether at the house of the prince or of the pauper.

Figure 12 represents the two rectangular copper boxes as they

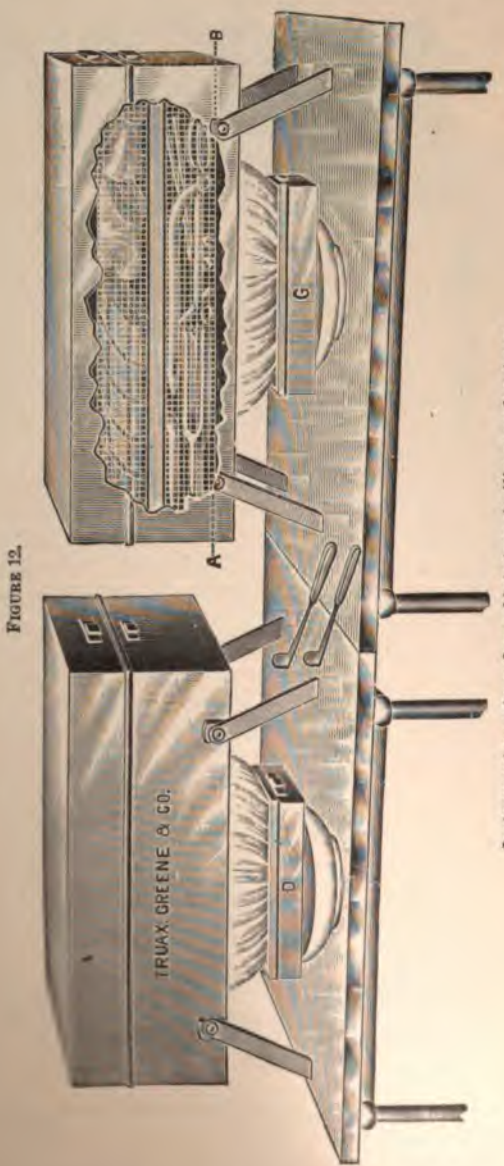


FIGURE 12.—Instrument-case transformed into two sterilizers under steam.

when used as sterilizers. Observe that each with four legs, which may be folded against when the box is not in use as a sterilizer.

Each box contains two gauze-wire trays, as shown through the broken side of the sterilizer in the right-hand cut of Figure 12. The lower tray is one inch above the bottom of the sterilizer, and con-

FIGURE 13.

The several parts of the combination instrument-case being used as sponge-basins, pans, and trays.

tains instruments. The upper tray, resting upon the lower, contains towels, dressings, ligatures, etc. The space of one inch between the bottom of the lower tray and the bottom of the sterilizer—*i. e.*, below the line A–B, Figure 12—is filled with sterilized water. The small

trays, D and G, are filled with burning alcohol. These trays are set upon saucers to prevent burning the table-top. The burning alcohol converts the water into steam, which sterilizes the contents of the wire-gauze trays. One of the two detachable handles resting on the table between the two trays may be used to put out the flame by lifting the small alcohol-tray in contact with the bottom of the sterilizer. These detachable handles are also designed for use in separating the different parts of the sterilizers after the sterilization is complete.

Finally, the several parts of this apparatus may be broken up into sponge-basins, pans, and trays. The two large copper boxes become sponge-basins. The two top covers become trays, holding sterilized water, inside of which two of the gauze-wire trays containing the instruments are placed. See Figure 13, F and E.

The gauze trays may be lifted out by the detachable handles and placed in the covers without handling the sterilized instruments. The other two gauze trays to the left of the sponge-basin (Figure 13) hold the towels, gauze, sponges, dressings, and other things which have been sterilized in them. The two small, square, shallow cups which contained the alcohol now become trays for needles, ligatures, and other small appliances. See Figure 13, H and G. Observe that this sterilizer is quite as well adapted for sterilization by boiling-water as by steam. After the apparatus has been under steam for sixty minutes, especially if this process has been repeated three times on consecutive days, not only the contents, but also the various parts which are to be used as sponge-basins and trays, are thoroughly sterilized. Each member of the apparatus is supplied with one or more slots or rings, into which fit the detachable metallic handles already mentioned. These handles are useful to separate the sterilizer into its several parts while hot, and to avoid unnecessary handling. After an operation, even upon a septic case, all the parts of the apparatus may be washed and then sterilized by boiling in a large wash-boiler. The boiling water should contain 2 per cent. of sodium carbonate.[1]

Preparation for an Aseptic Abdominal Section.

Asepsis necessitates a number of antiseptic procedures all looking to an aseptic result. The scrupulous preparations about to be outlined for major operations are not intended to imply that equal care is unnecessary for minor operations, because the latter are by no means free from danger of fatal sepsis, and because a performance seemingly of minor importance in the beginning may end, accidentally or purposely, in opening the abdomen or in some other capital procedure. Traumatic infection of the peritoneum involves the gravest consequences, hence the need of extreme precautions in technique; and since the greater may include the lesser, the same technique will suffice for the minor procedures.

The recklessness which results in the unnecessary removal of

[1] Where steam sterilization is used with thoroughness, is effective, though probably less effective than the boiling process. The latter is impracticable for sterilization in private houses where steam may be obtained. Bandages may be sterilized by the formaldehyde gas, transferred to the antiseptic jars, and boiled at the patient's house by steam.

pelvic organs seldom escapes criticism. The recklessness which results in the unnecessary introduction of sepsis into the peritoneum is often passed by without comment. The danger to life, however, is determined less by what the surgeon takes out than by what he puts in. The development of sepsis requires two conditions: first, pathogenic bacteria must be present; second, the way must be opened for them to enter. Experiment has shown that they may be transmitted even through the unbroken skin or mucous membrane, but that traumatism makes an open door. Pathogenic bacteria have their source, first, in the operator or his assistants; second, in the instruments and other appliances; third, in the patient. The antiseptic procedures to an aseptic result must, therefore, be these:

1. Preparation of the operator and his assistants.
2. Preparation of the instruments, sponges, dressings, and other appliances.
3. Preparation of the patient.

1. Preparation of the Operator and His Assistants.

The operator and assistants should be in good health, and, since the breath may be a medium of infection, they should especially be free from nasal catarrh and coryza. Disorders of nutrition which involve deficient elimination through the bowels and kidneys may throw that function upon the lungs, and cause the breath to be loaded with fetid products, an undoubted source of infection. The bacteria of saliva may be most infectious; hence unnecessary talking over the field of operation is objectionable, for small particles of saliva and its bacteria may reach the wound. The daily bath is an important part of the routine of aseptic surgery. Special clothing made of washable material is desirable; for women the usual costume of the trained nurse, and for men trousers and shirts or short coats. Special clothing for operation has a threefold advantage. It protects the operator from taking cold after leaving the operating-room in his ordinary clothing, which, if worn during the operation, might be wet with perspiration. It saves the ordinary clothing from contamination when the operation is upon a septic case. It is, above all, an antiseptic measure in the interest of the patient.

Sterilization of the Hands and Arms. The extreme mortality of abdominal sections in former times was due in great part to direct infection from the hand of the operator. To wash the hands rapidly in soap and water and then to dip them in some antiseptic solution, a not uncommon practice even now, gives little protection against infection. Absolute sterilization of the skin without injuring it is ideal and impossible. Practical asepsis, however, is possible. To bring this about numerous antiseptics have been used; by antiseptics is meant antiseptic drugs and antiseptic measures. Of these, prolonged scrubbing with green soap sterilized by heat and with hot water are the most effective. A mixture of alcohol and sulphuric ether, which have germicidal properties, each one part, with four parts of green soap, makes a valuable liquid antiseptic soap. The green soap should

be of good quality and previously sterilized by heat. Beat one pound of this soap in a capsule with two ounces of alcohol until uniformly smooth. Transfer to a glass bottle of at least three pints capacity and add two ounces of ether. Cork well, agitate, and set aside for two hours. Then add, with thorough shaking, two ounces each of ether and alcohol previously mixed. The scrubbing of the hands and forearms, to be effective, must be in soap and water as hot as can be borne without positive discomfort. The heat is a valuable aid in the removal of dirt. The scrubbing must be thorough and vigorous, and prolonged for at least fifteen minutes. The longer the scrubbing the more difficult it is to cultivate bacteria from the scrapings of the skin.

Prolonged scrubbing makes the hands safe, not so much by the destruction of the bacteria as by their mechanical removal. They are removed together with the secretions of the skin and other foreign matter upon which bacteria flourish. To scrub the hands and forearms always use a very large brush, preferably without handle. The large brush is indispensable; it cannot, however, be made to reach those strongholds of bacteria so often overlooked or neglected, the angles between the fingers; to scrub out these angles thoroughly use a brush with a handle of ordinary size, but do not attempt to scrub the other parts of the hands and the arms with such a brush; it is too small. Destroy all brushes that have been used in septic cases. Brushes not in actual use should be made aseptic and kept in aseptic gauze or towels.

After scrubbing with sapo viridis—preferably the liquid antiseptic soap just mentioned—wash off all traces of soap with clean water, then immerse the hands and lower portions of the arms in a saturated solution of potassium permanganate; the stain of the permanganate is removed by immersion in a saturated solution of oxalic acid. The hands are then successively washed in alcohol, solution of corrosive sublimate (1 : 3000), and sterile water. The alcohol dehydrates the skin and thereby prepares it for the more efficient action of the sublimate.

Rubber Gloves.—Rubber gloves serve as protection alike to the operator and the patient, and in all abdominal operations should be worn by all persons whose hands are brought into relation directly or indirectly with the field of operation. They may be sterilized by boiling after each operation, and used again and again. One pair of gloves on the hands of an expert operator will usually serve for several operations. The putting on and off is facilitated by dipping the hands and gloves in sterile soap and water. Only two plausible objections to the use of the gloves have been raised: first, that the hands can be adequately sterilized, and that the gloves are therefore unnecessary; second, that they impede the operator to such an extent as to increase rather than diminish the danger of the operation. The reason for the first objection is not true; but if it were true that the hands can be adequately sterilized, it by no means follows that they always will be. The second objection, that gloves impede the operator to any considerable degree, can be urged by no one unless he would

thereby give such evidence against his own dexterity as will raise the question of his fitness for surgical work. Gloves may be dispensed with in exceptional cases when very rapid work is of vital importance. The use of the gloves should in no respect lead to relaxation in the sterilization of the hands, for they may be cut or punctured during an operation.

Sterilization of the Nails, Hair, and Beard. Let the nails be cut short; long nails retain quantities of dirt which any amount of scrubbing may fail to dislodge. They are also a possible cause of unnecessary irritation, not to say traumatism, and may therefore be both the carriers of poison and the instruments for its inoculation. The shorter the hair the less dirt will there be to fall from it into the wound. The hair and scalp must be kept clean by frequent washing and brushing. The long, full beard is an unnecessary source of danger; the less beard the better. A gauze turban about the operator's head guards the wound from fine particles of dirt which might otherwise fall from the hair; if brought well down on the forehead, the turban absorbs perspiration and thereby keeps it from dropping into the wound. The operator's forehead, if wet with perspiration, may be kept dry by means of a towel in the hand of a special assistant.

The hands and arms are now immersed in a saturated solution of permanganate of potassium until stained a deep mahogany color, and then in a hot saturated solution of oxalic acid. This decolorizes and completely sterilizes them. The acid solution may now be washed off in sterilized water.[1]

2. Preparation of Instruments, Sponges, Dressings, and Other Appliances.

Sterilization of Instruments. All instruments not injured by heat may be sterilized by boiling or by steam. Sterilization by boiling takes only two or three minutes if the boiling water contains 1 per cent. of sodium carbonate. This method is perfect in its results even though the instruments have been used in a septic case. Boiling in carbolic-acid solution is no more efficient, and it injures the instruments.

Before and after an operation instruments, sponge-basins, trays, and other appliances may be thoroughly washed in soap and water to remove the visible dirt, and then sterilized by boiling in a large wash-boiler. A good way is to sterilize instruments by boiling just after using, and by steam just before using. During an operation the instruments should be arranged in trays and covered, not with antiseptic solutions, but with sterilized water.

Sterilization of Water. Water may be sterilized by boiling for thirty minutes, three times on three consecutive days. One boiling for thirty minutes makes it safe for surgical purposes. If not already clear, it should be filtered before boiling. In aseptic surgery sterilized water is indispensable for many purposes, such as to wash the hands, to cleanse the field of operation, to irrigate the wound, to wash

[1] Kelly. Operative Gynæcology.

sponges, to cover instruments in the tray, and, when indicated, to wash out the peritoneal cavity. Ten gallons should be sterilized for an abdominal section. Hospitals are usually provided with receptacles for sterilized water. At the patient's house water may be sterilized and kept until the time of the operation in two large wash-boilers, preferably new. It should be kept half hot and half cold, so that by mixing the right temperature may be secured.

Sterilization of Towels. Towels should be of good quality and free from lint; the so-called glass-towels used for drying glassware are the best. They should be laundered in the ordinary way, then boiled in a 1 per cent. solution of sodium carbonate, ironed, done up in sterilized linen, and packed in a clean, tight box. Twenty towels are required for an ordinary abdominal section. Just before operation they should be re-sterilized by steam or by formaldehyde gas, or by both.

The Sterilization of Sea-sponges by the usual processes of washing and soaking in antiseptic drugs is tedious, difficult, and not always adequate. The uncertain results of these methods have led most abdominal surgeons to abandon sea-sponges, and to substitute for them the readily sterilized gauze. Sea-sponges, however, have greater absorbing power and greater elasticity; they are therefore superior to gauze both for sponging out blood and for packing to control small bleeding-points by pressure. Notwithstanding these advantages, they are sterilized with great difficulty, and are therefore not preferred.

Since the introduction of the formaldehyde gas process sea-sponges, it is said, may without injury be sterilized in a few hours, and may therefore again come into general use. Before exposure to the gas they should be soaked in water to expand and open their pores, placed in a canvas bag and the sand beaten out of them, then washed through several waters for a long time, or placed under a faucet from which water may run over them for several hours until all remaining sand has been washed out.

The Sterilization of Gauze Sponges is by boiling, by steam, or by formaldehyde gas, or better by both. They should be made of four thicknesses of sterile gauze, and should be six inches wide by eighteen to twenty inches long. Smaller sponges may be overlooked in the abdominal cavity and lost, or, at the end of a long operation in which many sponges have been used, they may be difficult to find. The frayed edges of the gauze should be turned in and stitched; otherwise, loose threads may stick to the wound or be left in the cavity and become irritating foreign bodies.

The Sterilization of Silkworm-gut, Silk, and all Dressings may be by formaldehyde gas or by steam. Three sterilizations on consecutive days are desirable.

The Sterilization of Catgut by boiling in alcohol and soaking in antiseptic solutions is not always reliable. The gut may be rendered surgically safe by either one of two processes:

1. The dry-heat process of Boeckmann.
2. The formaldehyde process.

1. **The Dry-heat Process.** The individual strands, cut in lengths

of two or three feet, are coiled, and each is double wrapped in paraffin paper and placed in a small envelope and carefully sealed. The envelopes are then placed in a wire basket. This is exposed to dry heat, temperature 284° F., for a period of three hours on each of three successive days. It is necessary that the temperature on the first day be gradually raised to the required degree; this is because the gut is rendered brittle by a rapid increase of temperature before the moisture has been dried out and replaced by the absorption of paraffin from the paper. Let the temperature be raised to 212° F. at the end of the first hour, and maintained at this point for one hour continuously; then raise it gradually so that at the end of the third hour it will be 284° F. The temperature must now be held between 284° and 300° F. for three hours. In repeating the process on the second and third days the temperature may be rapidly raised to the required degree.

2. **The Formaldehyde Process.** Formaldehyde forms definite chemical compounds with albuminoid substances. The chemical process which takes place in the albuminoids so modifies the character of the gut that it will resist boiling in water for twenty or more minutes. The immediate action of the formaldehyde is to render the gut brittle. The tensile strength, however, is restored by boiling, and the boiling may be repeated one or more times without material injury to the gut. After boiling the gut may be preserved for use in absolute alcohol, or a sufficient quantity for use may be boiled just before each operation. Ligatures prepared by this process will resist absorption as long as the ordinary chromic catgut. The writer has found them intact six weeks after the operation. Dry heat may be substituted for boiling.

The formaldehyde process comprises five steps:

1. The gut is tightly wound on sections of glass tube, and the ends are secured. This prevents contraction and thickening on boiling.

2. The fat and other soluble substances are removed by soaking for twelve hours in ether.

3. The gut is transferred to a 5 per cent. solution of formaldehyde and soaked in it for twenty-four hours.

4. The tubes are kept under constantly running water for twenty-four hours, to wash out the excess of formaldehyde.

5. Final sterilization is secured by boiling twenty minutes in water.

Aseptic and Antiseptic Dressings, such as gauze and absorbent cotton, are now articles of commerce. If obtained from the best sources, they may be reliable. Absolutely safe antiseptic and aseptic gauze may be readily prepared by the surgeon or nurse. Many kinds of antiseptic gauze are used; two varieties, however, the sublimated and the borated, fulfil all indications. Aseptic gauze is also necessary. Sublimated gauze is useful for external dressings; it is contraindicated in the dressing of exposed surfaces, because dangerous, even fatal, poisoning has resulted from absorption of the bichloride of mercury. It should never be put into the abdominal cavity. Borated

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often the patient's peculiarities may be measured, and her power to resist infection may be increased. Let the abdomen and thoracic organs be examined, especially the lungs, heart, and kidneys. A quantitative examination of urine may show a deficiency, for example, of urea; then a few days of judicious diet and diuretics may turn the result of an operation in the patient's favor. The daily general bath, with friction, besides being an antiseptic measure, increases the action of the skin and relieves the kidneys.

The Bowels. Bowel distention impedes the operator and lengthens the operation. It is a dangerous complication both during and after the operation, and is the cause of a great deal of mortality. So far as practicable, then, let the bowels be emptied of gases and solids and of whatever may ferment and form gas. Experiment has shown that the countless myriads of bacteria habitually present in the intestine may be reduced by catharsis and intestinal antiseptics to a relatively insignificant number; hence the following measures are suggested to render the bowels, as nearly as possible, aseptic:

1. For several days before the operation exclude all food that is liable to ferment.–

2. On the third night before the operation give five grains of blue mass. If the bowels do not act freely the next morning, give an ounce of castor oil. One day before the operation give a Seidlitz powder or some other active saline purge. Two compound cathartic pills may be substituted for the blue mass. Repeat the cathartics if necessary.

3. Give repeated high copious enemas during the two days before the operation. The enemas may be of stiff soapsuds, each pint containing, thoroughly mixed, a drachm of turpentine. Persevere in this until no considerable amount of gas remains. If the turpentine and soapsuds enema does not suffice, try a mixture containing two ounces each of glycerin, Epsom salts, and water. Use a flexible rectal tube with firm walls, three feet long, and give the enema as high as possible.

4. Give, also, four times a day, an intestinal antiseptic. Bismuth, salol, compound tincture of cardamom, and guaiacol are among the drugs commonly used. Nothing is better than a capsule containing powdered cinnamon, three grains; oil of cinnamon, one-third grain; and salicylate of bismuth, three grains.

Cleansing the Field of Operation. Every abdominal section may require, for drainage or for other reasons, that an opening be made from the peritoneal cavity into the vagina; hence the necessity of cleansing not only the abdominal wall, but also the vaginal surfaces and external genitals.

Cleansing the Abdomen. On the night before the operation shave the hair from the mons veneris and external pudenda; scrub the abdomen with green soap and hot water, and cover it with a poultice of green soap. Let the poultice be removed in two hours, and the soap thoroughly washed off. Soap is incompatible with the corrosive sublimate about to be applied. Next wash the abdomen

with alcohol, then with ether, and apply a large, thick gauze dressing saturated with a 1 : 3000 solution of bichloride of mercury.

Cleansing the External Pudenda and Vagina. The mons veneris and vulva having been shaved, three vaginal douches are to be given on each of the three consecutive days before the operation. Each douche should consist of, first, strong soapsuds made of green soap; second, sterilized water; third, solution of bichloride of mercury, 1 : 3000.

Just before beginning an operation, when the patient is under the anæsthetic, the external genitals and surrounding parts should be thoroughly scrubbed with a large, soft nail-brush, and the vagina should be scrubbed and swabbed out with a wad of gauze in the grasp of a long hæmostatic forceps. Sterilized green soap or the liquid antiseptic soap already described should be used. All soap should be now washed away by a stream of sterilized water poured from a pitcher, and the parts further sterilized by another stream of 1 : 2000 bichloride of mercury solution. It is wise, especially in a case of infectious endometritis, to curette and disinfect the endometrium before proceeding to open into the pelvic cavity. This precaution may prevent post-operative infection in the pelvic cavity by extension from the uterus.

Immediately before opening the abdomen scrub the surface with a sterile brush or a wad of sterile gauze, using sterile soap and water. Then wash the abdomen successively with sterile water, alcohol, and corrosive sublimate 1 : 3000.

In the giving of the douche the Kelly pad will be found more useful and more practical than the bed-pan. Figure 14 shows the

FIGURE 14.

Kelly's pad.

appliance, and also makes evident the use of it. The two objections to Kelly's pad are, first, that it is not always obtainable; second, it is difficult to keep clean, and is therefore, for surgical purposes, apt to be septic.

The writer uses a practical substitute for the Kelly pad that obviates both objections. It is simply a piece of sheet rubber, three feet wide and four and one-half feet long. The rubber sheet at its upper end and sides is folded over rolls of toweling or muslin, so that, as in Kelly's pad, the water will be directed into the bucket below. See Figure 15. Rubber sheeting is available everywhere, is easily cleaned, and so inexpensive that it may be frequently renewed.

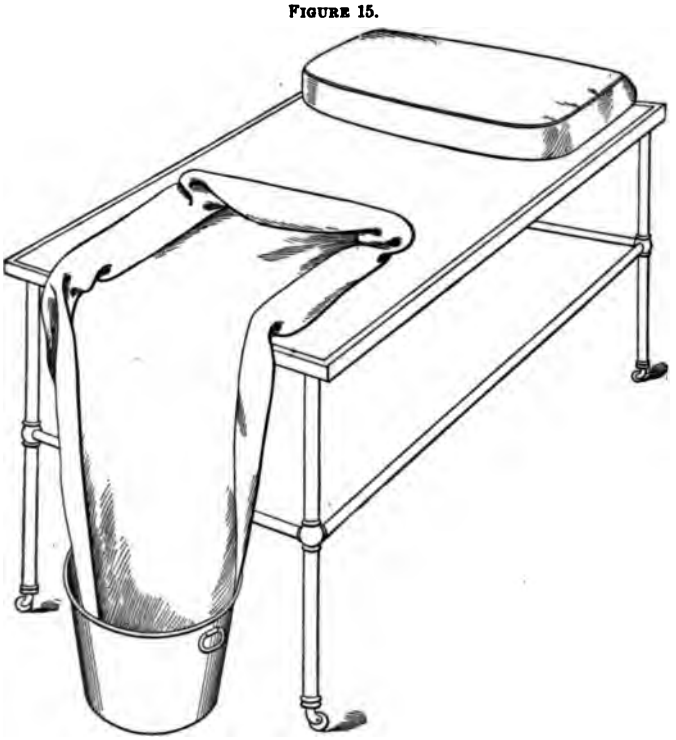
Sheeting which has the rubber finish on both sides is preferable. The ordinary oil-cloth used to cover a kitchen table is serviceable, and may be obtained in almost every house.

When the patient is placed on the table before the anæsthesia begins, it is well to cover her feet and legs with long sterilized flannel stockings.

Preparations for an Aseptic Vaginal Operation.

The surgery of the vaginal portion of the pelvic floor is usually classified under the head of minor operations. This designation, since it implies that the operations are trivial and safe even without full precautions, is misleading and dangerous. High vaginal amputation of the cervix uteri and the removal of an intra-uterine tumor by

FIGURE 15.



Practical substitute for the Kelly pad.

morcellement, for example, are clearly major operations. Curettement, perineorrhaphy, trachelorrhaphy, dilatation of the cervix, closure of vaginal fistulæ, though relatively safe, are in an absolute sense dangerous. Failure to observe aseptic technique in vaginal operations, although less frequently fatal, is yet full of danger. The possibility of a fatal pneumonia or nephritis as the direct result of an unclean "minor" vaginal operation is not sufficiently appreciated. A single case will serve to illustrate—"From one know all."

"A woman, fifty-eight years of age, six weeks after a perineorrhaphy gradually developed symptoms of nephritis. Examination of the urine then showed albumin and hyaline and granular casts. She gradually grew worse, and died in coma a week later. At the autopsy minute abscesses were found in the liver, spleen, kidneys, intestines, and in the heart-muscle. Agar-agar Esmarch tubes made from these organs gave in every case a pure culture of staphylococcus pyogenes aureus. The entrance of infection was found to have been the deep perineal tissues, where, just beneath the line of wound, small collections of pus were found. Externally, the wound appeared to have healed perfectly."[1]

The Asepsis of Minor Manipulations and Examinations.

Since the unclean uterine probe has repeatedly caused fatal metroperitonitis, and since "death has been carried to many a woman under the finger-nails," it follows that the same principles which apply to surgical work also hold good in the ordinary routine examinations and local treatment of the pelvic organs.

Asepsis of the Patient. Sterilization of the endometrium, vagina, and vulva preparatory to ordinary office manipulation is impracticable, not to say impossible. Reasonable safety is, however, secured by the hot vaginal douche, which the patient usually takes before applying for treatment. As a supplement to this it is best to wipe out the vagina with dry absorbent cotton on long lock forceps, and then with absorbent cotton saturated with a 5 per cent. solution of carbolic acid in glycerin, or with a 1 to 2000 aqueous solution of bichloride of mercury. Disinfection of the vagina or vulva in this way is especially essential if the uterine cavity is to be instrumentally or digitally exposed or treated. By this means the endometrium is protected against the entrance of septic matter, which otherwise may be easily carried in from the vulva or vagina on the instrument—a very common mode of infection.

Asepsis of the Hands. The cleaning and disinfection of the hands and nails before and after the most ordinary digital examination are imperative, not only to guard against the carrying of poison from patient to patient, but to prevent self-inoculation with specific or non-specific virus through some abrasion upon the hand. Let the nails be trimmed short.

Asepsis of the Instruments. The usual practice of simply washing an instrument in soap and water after each treatment is unsafe. Ordinary washing does not remove micro-organisms. Surgical cleanliness may be secured in the following manner: Wash the instruments in hot water and green soap; let each instrument be thoroughly wiped with absorbent cotton saturated with 90 per cent. carbolic acid in glycerin. To do this easily two strong forceps are needed, one in the left hand to hold the cotton, the other in the right hand to hold the instrument. The instruments thus moistened with carbolic acid are then thrown into a pan containing a boiling 3 per cent. aqueous

[1] Hunter Robb. Aseptic Surgical Technique, p. 64.

solution of sodium carbonate, and left there for at least two minutes. It is convenient for this purpose to have always during the office-hour a deep tray of the solution constantly boiling over the flame of a spirit-lamp or a gas-burner. A better way is to have several sets of instruments, which may be used one after the other, and then all disinfected together at the end of the office-hour. This saves time and insures safety.

The camel's-hair pencil, brush, and sponge cannot readily be sterilized, and are, therefore, dangerous for repeated use. Absorbent cotton wound upon an applicator or stick, or grasped by the dressing-forceps, may be used for purposes of local application or for wiping out the vagina, and may then be destroyed.

The Lubricant of Vaseline or Oil, usually kept near the examination-table, is unnecessary for lubricating purposes when the natural secretions are profuse and themselves serve that purpose. Some artificial lubricant is always useful, however, to protect the operator's fingers against infection; but the lubricant is often a source of sepsis in itself, or it may easily become so by contact with the unclean finger or instrument. Gonorrhœal and other infection is frequently carried from patient to patient in this way. Neither fingers nor instruments, therefore, should come in contact with the lubricant, unless they are free from vaginal and other secretions—unless absolutely clean. The lubricant should be aseptic and non-irritating. Olive oil and vaseline are often septic and always hard to wash off. Soap is apt to irritate the sensitive vulva. For several years the author has used glycerin. It is a most excellent lubricant and deodorant. Even after digital examination of extremely fetid utero-vaginal cancer, the foul, nauseating odor, usually so lasting, may be washed off the examiner's hand by placing it under a stream of running water, if before the examination the hand was freely lubricated with glycerin. For this purpose a superior quality of glycerin is required.

The adaptability of glycerin for this purpose has led to the preparation of a glycerin ointment. It is put up in soft metallic collapsible tubes, such as are used for vaseline and paints. The ointment is forced out of the tube by compressing the bottom between the thumb and finger and folding the flattened end as the tube is emptied. The use of the tube obviates the risk of contaminating the lubricant by the soiled fingers. The preparation is a sterilized combination of the following ingredients: Oil gaultheria, 2 gm.; boric acid, 23 gm.; cornstarch, 88 gm.; pure glycerin, 885 gm.; tragacanth, 17 gm.[1]

A Word of Caution or Protest. Many a distressing pelvic infection owes its origin to meddlesome office gynecology. Instrumental invasion of the endometrium and other manipulations which require much force are procedures which, under any conditions, may be far from trifling. The physician's office does not furnish for them a uniformly safe environment. They require and should have the safeguards of the home or the hospital.

[1] The formula is the outcome of numerous experiments by Parke, Davis & Company, who, upon the author's suggestion, have perfected the preparation. It is made by them under the name "Glycerin Emollient."

CHAPTER III.

DIAGNOSIS.

THE subject is divided into two parts: first, the clinical history; second, the physical examination.

The Clinical History.

Before asking questions or recording any of the history it is well to let the patient make her own statement without suggestion; this will relieve her of nervousness and compose her mind for the systematic questioning.

Histories are usually kept in blank case-books printed and bound for the purpose. A very practical way is to keep them in individual envelopes, made of strong manila paper, each history in an envelope by itself, with the name, residence, and date of the first visit written across the end. The histories are kept in alphabetically arranged pigeon-holes, where they may be readily found. The great advantage of this plan is that the histories may be written away from the office on scraps of paper, and do not have to be copied, but may be filed away together with any subsequent correspondence, prescriptions, or additional notes.

Form for Record of Cases. The skeleton form given on the following pages is suggested for the convenient and systematic record of cases. The printed blank is subject to such erasures and additions as the individual case may require. In using such a blank one must keep in mind the fact that no stereotyped form can include suggestions for all the points that are liable to come up in connection with a case. Unless, therefore, one supplements the inquiry by such questions as each special case may call for, he will fall into a dangerous routine.

The record form here presented will help the student and young practitioner to form the habit of accurate and systematic diagnosis. As one gains experience and automatic grasp, and judges less from multiform details and more from principles, he will gradually eliminate from his histories and records all that is not essential to the efficient analysis of his cases. A few general statements may then serve the purpose of a practical memorandum.

In recording a case one may conveniently use abbreviations and signs, for example, the plus sign (+), the minus sign (−), the plus or minus sign (±), the zero sign (0), the sign of equality (=); and the letter n may signify (+) excessive, (−) less than normal, (±) variable, (0) no, none, or negative results, (=) equals or amounts to, (n) normal; v. s. = 0 would be, for example, a short expression for indicating the absence of vesical symptoms.

RECORD OF A CASE;

ABBREVIATIONS: The sign + signifies excessive; –, less than normal; v, variable; 0, no, none or negative results; n. signifies normal.

Mrs Blank. Address 100 Zero Street.

Age 45 Date of first consultation January 1, 1898.

Recommended by Dr. William Williamson.

1. Nationality American Occupation Housewife Weight 115 pounds. Dates illness from parturition

2. ~~Single~~, Married, ~~Widow~~ 10 years. 3. Well, ~~ill~~ developed. ~~Nutrition good~~ anemic ~~plethoric~~.

4. Family History: Negative.

5. Menses: First menses at age 13. ~~Always~~, usually regular, ~~irregular~~, every ~~——~~ to 28 days; continues ~~——~~ to 6 days. Amount, ~~normal, small~~, large, ~~clotted~~ N Color. Last menses commenced December 10, 1897 ended December 16, 1897.

6. Dysmenorrhoea: ± pain inguinal, right and left, shooting down thighs, hypogastric, lumbar, bearing down, constant, ~~remittent intermittent~~ for one day before, and during, ~~——~~ after flow. ~~In bed~~ 4 days.

7. Intermenstrual Pain: As above but in less degree

Frequent, ~~constant, intermittently remittent~~. ——— Walking and especially standing cause bearing down, sensation and exhaustion Frequent occipital headache

8. Children: Number 3; oldest 9; youngest 6. Labors ~~normal~~, rapid, ~~tedious, instrumental~~. After each labor was in bed 8 weeks. Getting up ~~well~~, ill from first labor after period of high temperature with pelvic pain

9. Abortions: Number 2; first at 3 months; last at 4 months. In bed 3 weeks. each time

10. + Leucorrhoea: First appearance 9 years ago. ~~Bloody~~, ~~purulent~~, muco-purulent, ~~mucous thick, thin, white, dark~~, glairy, offensive. Constant, + worse before, and ~~during~~, after menstruation.

11. Bladder Symptoms: ~~Dysuria~~, ~~incontinence retention, dysuria~~. Urinates ± times during, night, ± times during day. Frequency ~~not~~ increased by standing or walking.

12. Digestion: Teeth N, appetite ± eating causes ± distress, distention, nausea, ~~vomiting~~, eructation, flatulence, acidity, ~~immediately~~, an hour or two after eating. Regular habits of eating. Kinds of food all, + tea, + coffee, ~~alcohol~~. Foods containing much starch and sugar disagree

13. Bowels: ~~Regular~~. + constipation and ± diarrhœa, alternating. Action ~~soft~~, scanty, ~~liquid~~, offensive, ± bloody, mucous, ~~purulent~~. Painful at times in ± pelvis, + at anus. Color ——.

× 5 Menorrhagia since birth of second Child

× 8 After first parturition evidently had pelvic inflammation.

X. Nervous System: Sleep badly

XI. Pelvic Pain: Heart slightly hypertrophied. Arterial tension high. Intestinal indigestion. General functional disturbance of the lower digestive organs and cerebro-spinal axis.

XII. Previous History: 0 except as above

XIII. Pelvic Pain due to: Menorrhagia, pelvic pain, neurasthenia, leucorrhea, headache and backache

XIV. Previous Treatment: The usual routine of local and general measures.

XV. Urinalysis: Amount in 24 hours 703 Sp. gr. 1008 Reaction N
Color Normal Albumen 0 Sugar 0 Urea 174 gr. Total Solids 600 gr.
Sediment & Centrifuge slight Microscopical Examination negative
Except few small fragments of granular casts

XVI. Physical Examination, Diagnosis and Treatment:

a. Extensive bilateral laceration of cervix
b. Laceration of perineum to sphincter ani muscle
C. Retroversion, third degree
d. Fallopian tube and ovary on left side sensitive slightly enlarged and adherent but not containing fluid.
E. Cystocele and rectocele.
f. Endometritis
g. Chronic interstitial nephritis shown by urinalysis and slight hypertrophy of heart.
h. Hemorrhoids.

Treatment advised. 1 Pelvic massage after Brandt's method. 2. Curettage, trachelorrhaphy and perineorrhaphy. 3 removal of hemorrhoids. 4 Regulation of bowels by diet tonic: laxative treatment and exercise. 7 Regulate diet and mode of life relative to intestinal indigestion, interstitial nephritis and general tendency to arterial sclerosis

This hypothetical case is not out of the common. The patient had been a well-developed woman, of good family history. The menstrual and other functions had been perfectly normal until after the first child was born. Then came the abnormal developments recorded in sections 6 to 19. Neglected lacerations of the cervix and perineum opened the door for the entrance of infection; hence infection spread through the endometrium and possibly also through the parametric lymphatics and veins to the left tube, ovary, and adjacent peritoneum. Adhesions formed, binding the uterus with its appendages together in a posterior displacement; this displacement was increased and perpetuated by the excessive weight of the uterus, by impairment of support from the lacerated perineum; that is, from injury to the pelvic floor and from the now relaxed, subinvoluted state of all the pelvic organs and their supports.

Endometritis and metritis give rise to menorrhagia and leucorrhœa. This explains, partly at least, the anæmia, neurasthenia, nervous irritation, and impaired general nutrition. Difficulty of walking and standing, both from general weakness and from displacement of the pelvic organs, interferes with necessary exercise, and still further adds to the cause of malnutrition. The increased frequency of urination when the patient is on her feet may be explained by the fact that the organs at that time descend to a lower level and drag on the bladder. Intestinal indigestion, sluggish liver, faulty metabolism, constipation, deficiency of urea and of other urinary solids, excess of uric acid, and finally chronic interstitial nephritis, are all not uncommonly associated with pelvic traumatism and infection.

The difficulties of gynecological diagnosis are often increased by the fact that pelvic lesions may exist and cause no definite local symptoms. Even greater confusion may arise from the presence of pelvic symptoms which are caused not by pelvic, but by extrapelvic disorders.

The nerve counterfeits of pelvic disease are most realistic and bewildering. Their clinical sequence is well expressed by the late Dr. William Goodell:[1]

"Nerve-strain, or nerve-exhaustion, comes largely from the frets, the griefs, the jealousies, the worries, the bustles, the carks and cares of life. Yet, strangely enough, the most common symptoms of this form of nerve disorder in women are the very ones which lay tradition and dogmatic empiricism attribute to ailments of the womb. They are, in the usual order of their frequency, great weariness and more or less nervousness and wakefulness, inability to walk any distance, and a bearing-down feeling; then headache, napeache, and backache. Next come scanty, or painful, or delayed, or suppressed menstruation, cold feet, and irritable bladder; general spinal and pelvic soreness and pain in one ovary, usually the left, or in both ovaries. The sense of exhaustion is a remarkable one: the woman is always tired; she spends the day tired, she goes to bed tired, and she wakes up tired—often, indeed, more tired than when she fell asleep. She sighs a great deal; she has low spirits, and she often fancies that she will lose her mind. Her arms and legs become numb so fre-

[1] Goodell. Introduction to Keating and Coe, Clinical Gynecology.

quently that she fears palsy or paralysis. Nor does the skin escape the general sympathy. It becomes dry, harsh, and scurfy, and pigmentary deposits appear under the eyes, around the nipples, and in the chin and forehead. The symptom-group of nervous exhaustion,—anæmia, backache, bearing-down, difficult walking, ovarian pain and menstrual disorders—although often without the least gynecological significance, is usually the signal for a gynecological diagnosis. Any pelvic organ showing the slightest irregularity is singled out as the culprit and promptly placed on trial. Endless injurious local treatment and grave surgical operations may now cause the woman to suffer many things from many physicians."

As Goodell aptly remarks: "If no tangible disorder of the sexual organs be discoverable, the invisible endometrium or ovaries must take the blame and receive the local treatment. Whatever the inlook or the outlook, a local treatment, more or less severe, is liable to be the issue. Yet these very exacting symptoms may be due wholly to nerve-strain, or, what is synonymous, to loss of brain-control over the lower nerve-centres, and not to direct or to reflex action from some supposed uterine disorder. Neither, for that matter, may they come from some real, tangible, and visible uterine lesion which positively exists. Thus it happens that a harmless anteflexion, a trifling leucorrhœa, a slight displacement of the womb, a small tear in the cervix, an insignificant rent of the perineum, or, what is almost always present, an ovarian ache, each plays the part of the will-o'-the-wisp to allure the physician from the bottom factor. To these paltry lesions—because they are visible, palpable, and ponderable, and because he has by education and by tradition a uterine bias—he attributes all his patient's troubles; whereas a greater and subtler force, the invisible, impalpable, and imponderable nervous system, may be the sole delinquent. The sufferer may be a jilted maiden, a bereaved mother, a grieving widow, or a neglected wife, and all her uterine symptoms—yes, every one of them—may be the outcome of her sorrows and not of her local lesions. She is suffering from a sore brain, and not from a sore womb."

We may admit the extreme wisdom of Goodell's summing up; at the same time we must insist that an exhaustive analysis of a patient's condition will often lead to conclusions less imponderable than his *ex parte* statement would imply. The case above outlined on the record blank will not only show an example of possible diagnosis; but, if analyzed, will also show that the cure of aggravated local lesions may not result in the complete recovery of the patient; such cure will, however, be an important step in the right direction. A common mistake, when there are other more general and, perhaps, more serious anomalies, is to expect, upon the correction of local lesions, prompt and complete relief. It would also be equally a mistake to follow the possible implication of Goodell, and, because we know that local treatment of palpable local lesions cannot completely cure the patient, fail to give that treatment, and thereby fail to cure her as far as we can.

It is, moreover, improbable that a harmless anteflexion, a trifling leucorrhœa, a slight displacement of the womb, a small tear of the

cervix, an insignificant rent of the perineum, or an ovarian ache would often lead a serious practitioner away from the "bottom factor" to useless or injurious gynecological treatment.

Not less essential than the gynecological part of the record is that which belongs to the general condition of the patient. Age, temperament, bodily habit, heredity, color, the heart and blood-vessels, the digestive tract, the liver, spleen, and, even more important, the kidneys, all demand close and careful attention.

The Physical Examination.

Examination calls into use the special senses, supplemented by such conditions, instruments, and appliances as will increase their power or widen their range.

The conditions to be fulfilled for an adequate examination are numerous and variable. Among them are: 1. Cleanliness. 2. Empty bladder and rectum. 3. A suitable table. 4. Proper attitude and position for the patient.

Cleanliness and asepsis have been emphasized in the last chapter; their importance cannot be exaggerated. Exception: If it is desired to study the character of the uterine, vaginal, or vulvar secretions, the preliminary douche and disinfection of the parts may be omitted.

The rectum and bladder should be empty for the following reasons: 1. These viscera, when full, displace the pelvic organs by pressure. 2. Retained feces and urine may be mistaken for solid and cystic tumors. The full bladder pushes the uterus and its appendages upward and backward and greatly increases the difficulty of conjoined examination. Even a small quantity of urine in the bladder may cause the patient to make the abdominal muscles so tense that the uterus cannot be felt between the hand over the pubes and the examining finger in the vagina. A preliminary cathartic to clear the bowels of feces and gas should therefore precede the first examination.

The Examining Table. The digital examination may be made with the patient lying on a sofa or bed; but, as Marion Sims has taught, "the one is too low and the other is too soft and yielding for a speculum examination." Even the digital touch and palpation are much better made on a table. If the bed is used, the patient should lie across it, with the hips well to the edge, and not lengthwise of the bed. The table is essential for a thorough speculum examination. The conventional office chair, although less objectionable than the sofa or bed, is, by comparison with the table, inferior. An ordinary pine kitchen table, two feet wide, four feet long, and two-and-one-half feet high, covered with a blanket and sheet and supplied with a pillow, will answer every purpose almost as well as the more elaborate table commonly used in office and hospital work. There is some advantage in having the end of the table upon which the pelvis rests about three inches higher than the end upon which the head rests.

In making a digital or conjoined examination with the patient lying on the table, the examiner stands at the foot of the table facing the patient, and passes the examining hands between the knees.

If a speculum examination is not required, digital examination may be satisfactorily made with the patient lying on a couch, and the examiner sitting. See Figure 16. This is the arrangement used by Brandt and his followers in giving pelvic massage.

FIGURE 16.

Position for diagnostic examinations and for the application of pelvic massage; the patient lying on a couch.[1]

The Position of the Patient. Two positions are in common use, the dorsal and the left latero-prone position of Sims. The knee-chest, the standing, and the prone positions are less frequently used. Each of these positions has advantages peculiar to itself and to the conditions under which it is employed. They will be described as the occasion arises.

Examination of Young Girls. The first examination of a young girl is approached with reluctance, and is, if possible, avoided. The advantages of anæsthesia from the standpoint of modesty must be apparent to all. If the hymen is intact, an effort should be made to gain the necessary information by a conjoined digital exploration through the rectum, the palpating hands being over the hypogastrium.

Conduct of an Examination. The clothing about the waist having been loosened, the patient steps upon a chair, and, the skirts having been raised behind, sits upon the extreme end of the table. She is then assisted to lie upon her back, the head, not the shoulders, being supported by a pillow. Before lying down she is covered with a sheet. Under the sheet, and without exposure, the feet are lifted from the chair to the table and placed six inches apart; the clothing

[1] Roberts. Ziegenspeck über Thuré Brandt's Behandlung von Frauenleiden.

in front is pushed above the knees and the knees are widely separated. The flexure of the thighs, secured by placing the feet on the table, relaxes the abdominal muscles and facilitates palpation. The edge of the sheet as it falls over the knees is parted back between the thighs so as to expose only the part to be inspected—that is, the vulva. The patient is assured that she is neither to be hurt nor unduly exposed. She is now ready for:

1. Inspection of the external genitalia.
2. Digital examination of the vagina and rectum.
3. Conjoined examination.
4. Percussion, palpation, and auscultation.
5. Mensuration.
6. Instrumental examination.

1. Inspection.

Careful inspection of the external genitals is desirable as a forewarning against possible inoculation of the examining finger with venereal or other infection. Some historic cases there are of surgeons who have gone to their death from this cause. Any abrasion on the hand should be protected with finger-cot or a collodion and cotton dressing: a very thin layer of cotton is placed over the abrasion before the collodion is applied. Look for lacerations, scars, and other evidences of parturition, vulvitis, tumors, urethral caruncles, urethritis, eruptions, hemorrhoids, anal fissure, fistula in ano, pinworms, pruritus, œdema, cystocele, rectocele, ulcers, inflammation of Skene's glands, and other anomalies. Note the calibre and elasticity of the vulvar orifice. Is the clitoris enlarged or imprisoned under an adherent prepuce? Such adhesions may give rise to pronounced reflex disorders. The virgin vulva is usually small, with the hymen perforated only by one or more small openings. It is, perhaps, needless to add that the absence of such a hymen is neither proof nor even strong evidence of unchastity. The virgin labia minora are small, firm, double folds of skin. If they are long, loose, and flabby, and especially if the vulvar orifice is patulous, the indications are that the woman has had one or more children, or has had much treatment, or has practised self-abuse, or has been the subject of some other mechanical interference.

Inspection is, however, not limited to the reproductive organs nor to external parts; it may extend through the aid of the speculum to the vagina, the interior of the bladder, the urethra, the rectum, and, by abdominal section, to the interior of the abdomen and pelvis. The surface of the abdomen is also open to visual examination, and by its enlargement and contour may disclose the presence or character of a tumor or ascitic accumulation. See differential diagnosis of ovarian cysts.

2. Digital Examination.

The advantage of the left index-finger in preference to the right was demonstrated and its use popularized by Marion Sims. The great

superiority of the left-hand method is usually acknowledged by those who have accustomed themselves to both. The following are some of the reasons: 1. The tactile sense of the left finger is more easily educated. 2. Its palmar surface more readily comes in close relations with the left side of the pelvis, and disease is more frequent on the left than on the right side. 3. The stronger right hand is better reserved for external palpation. 4. The right hand is left free to pass the probe or sound or to manipulate any instrument. One finger will usually obtain as much information as two. The introduction of two fingers, except in a capacious vagina, is painful. Two fingers may, however, sometimes be of use in the examination of tumors. The manner of digital touch has been well described by Emmet in the following paragraph:

"When the sense of touch has been cultivated, it yields more information upon which to base a diagnosis than can be gained by the eye alone, even when used under equally favorable circumstances. Therefore the digital examination should always be thoroughly and systematically made. It is all-essential to possess a knowledge of departures from a healthy condition. The lighter the touch the more acute it will be, and the more clearly will it appreciate slight changes. It is, indeed, remarkable how individuals vary in their method of making examinations. One will proceed with as much vigor as if he were boring a hole, and finds little more than the cervix, which feels like an obstruction in his way. He gains no information of importance, and inflicts unnecessary pain. Another will pass his finger lightly over every portion of the vagina, and, without having caused any pain, quickly ascertain enough to enable him fully to understand the case. The manner in which I have sometimes seen this examination made, even by men of experience, can be described only as brutal; the amount of suffering they needlessly inflict, and the want of tact evinced by them, ought to debar them from the practice of any branch of the profession."

The hands having been carefully washed, the left index-finger is lubricated with glycerin, mild castile soap, or glycerin emollient (Chapter III.), and then slowly introduced, the palmar surface being directed so as to depress the perineum toward the rectum; the rigidity of the perineum, the presence, absence, or condition of the folds in the rectum, the calibre and relaxation or rigidity of the vagina, and the condition of the sacrum and coccyx. The point of the finger is now directed alternately toward the anterior portions of the pelvis and swept around the vagina. The direction, size, form, and consistency of the cervix, the presence of the os externum, and the presence or absence of erosion are apparent. The right hand is now placed over the pubes, and the inquiry continued by contact. Irritation of the clitoris may give rise to sexual excitement, and the examining hand should be kept well away from it. Examination with the patient standing, has some value as a means of uterine displacements. Examination may be made in the left latero-prone position, but for gen-

eral purposes is not recommended. This position is reserved rather for speculum examinations and operations.

FIGURE 17.

Digital eversion of the anus.[1]

Eversion of the anus, as shown in Figure 17, enables the examiner to judge of the condition of the lower part of the rectum and anus. This may be done either in the dorsal or lateral position.

3. Conjoined Examination.

Conjoined examination, often called bimanual palpation, is designed to bring within the range of touch all the pelvic organs. These organs, one by one, are in some cases lifted forward, by the finger or fingers in the vagina, toward the anterior abdominal wall, where they can be palpated by the right hand pressed down behind the pubes. Usually, however, the right hand forces them down to a point where they may be readily examined by digital touch. The latter method is usually preferable, because the application of much force in the vaginal or rectal touch may be harmful to the patient or may impair the tactile sense of the finger. A combination of both methods is desirable. The necessary amount of force will vary with the tolerance of the patient and the skill of the examiner. The reach of the examining finger is materially increased by forcing the elastic perineum backward and toward the interior of the pelvis. This is usually not difficult, for during the examination the knuckles of the middle, ring, and little fingers on the left hand are pressed against the cutaneous surface of the perineum. Upward pressure on the perineum may be made with the three outside fingers closed, as shown in Figure 18, or open, as shown in Figure 19. In the latter and preferable

[1] After Mundé. Davenport's Diseases of Women.

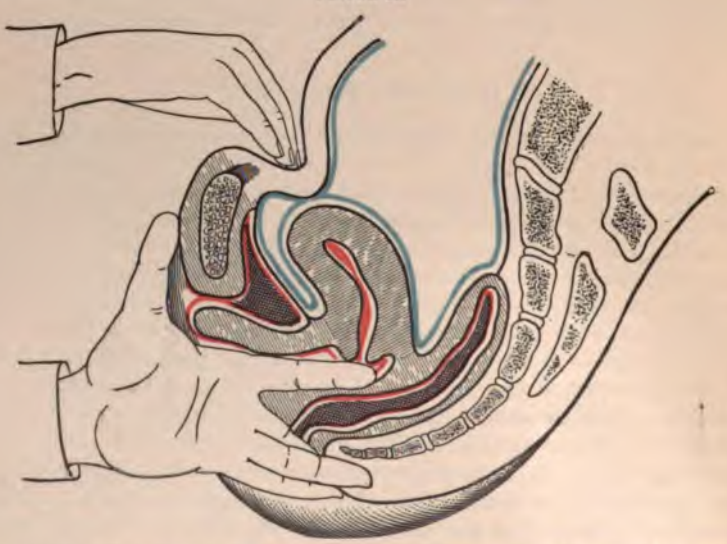
method the web between the index and middle fingers is in contact with the perineum and exerts the pressure.

Bimanual examination, to be effective, requires long practice. The

FIGURE 18.

Vaginal touch, conjoined examination.[1]

FIGURE 19.



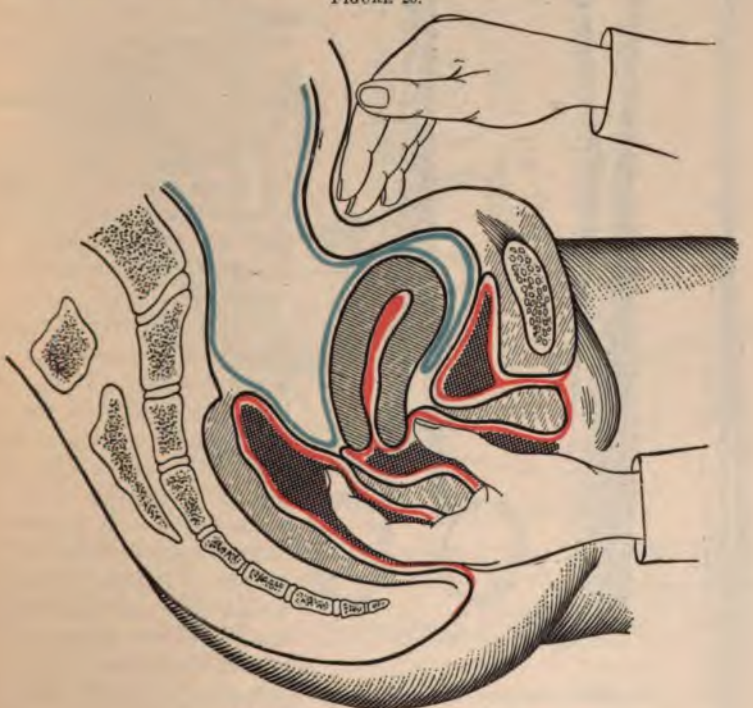
Vaginal touch; conjoined examination; outside fingers open; this is the preferable method.

beginner fails, first, to bring the organs properly between the two hands; second, to appreciate what may be within his reach. Should

[1] Emmet. Principles and Practice of Gynecology, p. 63.

the thickness or rigidity of the abdominal walls prevent the downward pressure of the hand behind the pubes, the resistance may be overcome by continuous, firm pressure, or by successive short strokes of vibratory massage, or by circular massage. The difficulty is often the result of the patient's nervousness. The examiner should, therefore, avoid sudden movements in manipulation. A deep inspiration by the patient, followed by a quick expiration, while steady pressure is being made, may momentarily relax the muscles, and thereby afford the examiner an opportunity of rapidly palpating the pelvic organs. An examiner of acute touch and quick perception will sometimes instantaneously

FIGURE 20.



Conjoined recto-vaginal palpation.

gain the required information in this way. During the examination the patient should keep the mouth open.

If the uterus and its appendages are sensitive, or fixed by adhesions, the attempt to force them up toward the outside hand may be futile or even dangerous. Deep palpation behind the pubes is then necessary. One should remember, however, that even a little force injudiciously applied by either hand may rupture a pus-pocket or tube, and thereby lead to serious results.

Bimanual palpation enables one to judge of the following conditions: the size, form, location, position, consistency, and mobility of the uterus, the presence or absence of a pelvic tumor. If the uterus is displaced, is it replaceable, or is it bound by adhesions, and there-

fore irreplaceable? If there is a tumor in the pelvis, is it a neoplasm or an inflammatory swelling? If the former, it is not sensitive; if the latter, it is tender on pressure. Is it connected with the uterus, or the Fallopian tube, or the broad ligament, or the ovary? Is it cystic or solid, malignant or benign? Does it originate in the pelvis or in the abdominal cavity, and, above all, is it possibly due to pregnancy? These questions will come up again under the diagnosis of special disorders.

FIGURE 21.

Uterine tenaculum.

FIGURE 22.

Small tooth-forceps. A, reduced size; B, section of full size.

Conjoined examination by rectal instead of vaginal touch may confirm, disprove, or supplement the previous observations and impressions.

Conjoined recto-vaginal palpation is made with the left index-finger in the rectum, the thumb in the vagina, and the right hand behind the pubes. See Figure 20. In this way the perineum is well pushed up toward the interior of the pelvis. If the abdominal wall is thin and relaxed, the various pelvic organs, when forced down by the hand behind the pubes, may be picked up, so to speak, between the thumb and finger and definitely palpated.

Palpation of the pelvic organs, especially the ovaries and Fallopian tubes, is often facilitated by drawing the uterus toward the vulva by means of a uterine tenaculum or small tooth-forceps. During the palpation these instruments may, if necessary, be held by an assistant. For this purpose Howard Kelly uses a tenaculum with corrugated handle. The cervix is caught with this tenaculum and drawn down to the outlet; then the tenaculum is held against the ball of the thumb, while the index-finger is inserted into the rectum or vagina, and used, in conjunction with the abdominal hand, to examine the pelvic organs.

Failure to engage the uterus between the two hands in conjoined examination may be due to a backward displacement, or to

rigidity of the abdominal muscles, owing to a state of sensitiveness in the parts under examination, or to the nervousness of the patient. The latter condition may call for anæsthesia.

FIGURE 23.

Palpation of the roots of the sciatic nerve by rectal touch.

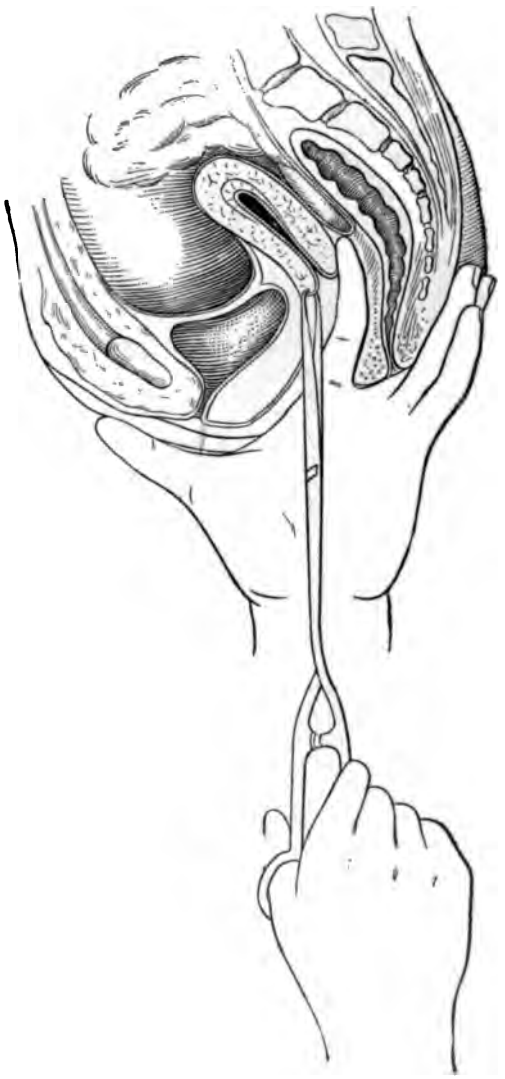
Rectal touch, whether digital or conjoined, may be impeded by coils of intestine in the pelvis interposed between the finger and the viscera to be palpated. This may be avoided by a simple device of Kelly's: "The rectum and bladder are first evacuated, the patient is put in the knee-chest posture, and a speculum is introduced into the rectum. This lets in a large amount of air, and the bowel balloons out and applies itself broadly over the sacral hollow and the posterior surfaces of the uterus and left broad ligament, and in a minute or two the small intestine falls away into the upper abdomen. The patient must then be turned on her back, care being taken to keep the pelvis constantly higher than the rest of the abdomen, so as not to let the intestines gravitate again into the pelvic cavity. On making the bimanual examination the pelvic viscera are felt with startling distinctness, the rectal finger enters a large air-cavity no longer impeded by the mucous folds; the opening from the lower into the upper rectum is readily found; and the posterior surface of the uterus and the ovaries and tubes feel as if skeletonized in the pelvis. They lie so clearly exposed to touch that their minuter surface-peculiarities, fissures and elevations and variations in consistency can be detected."

This peculiar ballooning of the rectum is often observed in obstruc-

tion and paresis of the bowel, and may be felt with the patient in the dorsal position without recourse to the device of Kelly.

The roots of the sciatic nerve may also be palpated through the rectum, as shown in Figure 23; such an examination will sometimes

FIGURE 24.



Uterus drawn down by means of tooth-forceps to facilitate manual examination or replacement.[1]

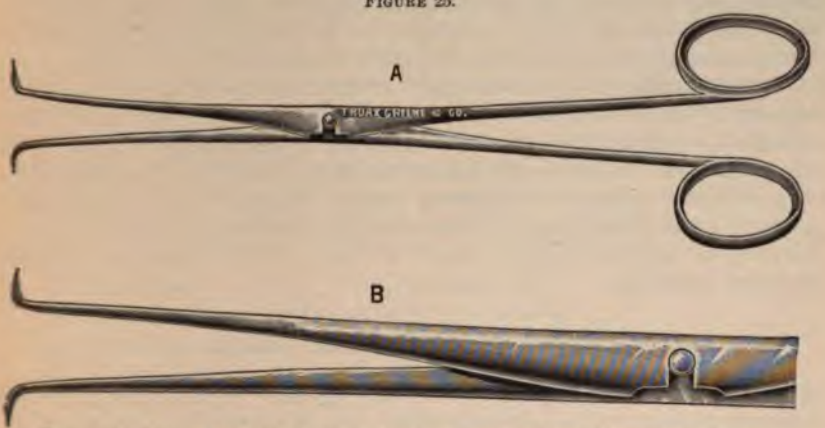
reveal the source of an obscure pelvic pain which has previously been attributed to an ovarian or uterine origin. The patient must

[1] Davenport's Diseases of Women.

be examined without anæsthesia, and as the fingers are drawn over the tender cord a cry of pain will be elicited.

Conjoined Examination with the Sound. One may be unable by touch to decide whether a tumor is of uterine or extra-uterine origin. The uterus may then be immobilized by the sound passed into the uterine canal and held immovable by the hand of an assist-

FIGURE 25.



Tenaculum-forceps for steadying the uterus. A, reduced size; B, section of full size.

ant, or the uterus may be steadied by a tooth-forceps or tenaculum attached to the cervix. The examiner may then determine whether

FIGURE 26.

Myoma in the anterior wall of the uterus.[1]

FIGURE 27.

Anteflexure of the uterus.[1]

the tumor moves with the uterus or independently of it. In case of

[1] Emmet's Principles and Practice of Gynecology.

a uterine tumor with a long pedicle, or of an extra-uterine-tumor adherent to the uterus, the test may fail.

The necessity of conjoined examination is apparent in Figures 26 and 27. Vaginal touch alone in Figure 26, which represents a myomatous uterus, would give the same impression as in Figure 27, which shows an anteflexed uterus. Conjoined examination in Figure 27 would establish the fact of anteflexion, while in Figure 26 it would demonstrate the presence of myoma. The exact direction of the uterine canal and the relations of the uterus to the tumor might have to be learned by passing the probe or the sound.

Anæsthesia. If the abdominal muscles are rigid, or the pelvic organs very sensitive, or the patient too nervous to permit an adequate examination, the surgeon should insist upon further examination under an anæsthetic. Intelligent treatment may otherwise be impossible. Accurate and adequate diagnosis lessens the number of exploratory incisions and unnecessary operations; or it may cut short a vast amount of indefinite, often injurious local treatment, and substitute rational surgery.

4. Percussion, Palpation, and Auscultation.

These means of diagnosis are applicable to the differentiation of abdominal tumors and enlargements of inflammatory origin. See Diagnosis of Uterine and Ovarian Tumors. The inquiry should include both gynecological disorders and others that simulate or complicate them. Among the latter may be especially mentioned diseases of the vermiform appendix. Inflammation of this part is so frequently associated with infection of the uterine appendages, especially on the right side, as to render imperative in every case a very careful examination for possible appendicitis. Equally important is the examination of the kidneys. One who has not systematically included the renal organs in his examination will be astounded at the revelations of such investigation. Hydro-nephrosis, abscess and stone in the kidney, tubercular kidney, loose and floating kidney, and stricture of the ureter are among the pathological conditions which are commonly and culpably overlooked by the gynecologist. In this connection the mere mention of intestinal, gastric, splenic, and hepatic disorders should be sufficient.

Relaxation of the abdominal walls, with consequent falling of the intestines—enteroptosis—associated also with the falling of other abdominal organs, especially the stomach and kidney, is a frequent and unrecognized cause of abdominal and pelvic disorders. See Pendulous abdomen and displacement of abdominal viscera, in Chapter XLIV.

5. Mensuration.

Mensuration is a most important factor in the examination of new growths and other lesions causing abdominal enlargement. The subject will be further considered in connection with the special diagnosis

of these disorders. The measurements of the bony pelvis frequently have great significance, not only from the obstetrical, but also, especially in the matter of displacements and malformations, from the gynecological point of view. The reader is referred for pelvic mensuration to the literature of obstetrics.

6. Instrumental Examinations.

As already stated, the development of modern gynecology has been made possible by the use of instruments of precision designed to increase the power or widen the range of the senses. This statement has even a greater force from the therapeutic and surgical standpoint than from the diagnostic. The diagnostic methods already described will usually furnish the groundwork of accurate and adequate diagnosis. Instrumental examination, however, may supplement and verify conclusions already reached. It is, however, as compared with digital touch, of minor importance. Some of the instruments used for diagnostic purposes are:

1. Speculum,
2. The sound and probe,
3. The dilator,
4. The curette,
5. The exploratory needle and aspirator,
6. The stethoscope,
7. The microscope,
8. The cystoscope.

The Speculum. The choice of the speculum is simplified by the statement that of the innumerable varieties only two require very serious consideration, and that these two act on the same principle—as perineal retractors. They are:

Sims' speculum.
Simon's speculum.

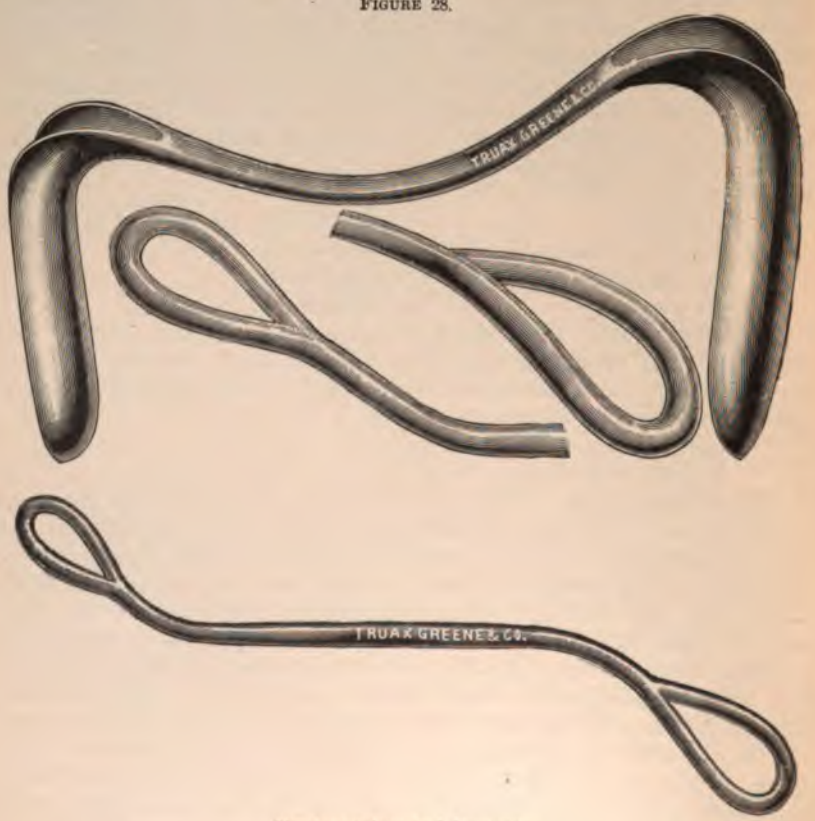
Sims' Speculum. This instrument is of great simplicity and effectiveness. The objection, sometimes urged, that its efficient use requires long practice, is a mistake. Whoever once masters the simple principles of the left latero-prone position will have little or no difficulty. The failure to appreciate the mechanical relations of this position to Sims' speculum will explain most of the disappointments resulting from its use. Another alleged disadvantage of Sims' speculum is the necessity of a trained assistant to hold it. If the examiner himself knows how the instrument should be held, the assistant need not be trained. In gynecological examinations the presence of a third person is, for obvious reasons, an advantage. Examinations at the patient's house may usually be made with the assistance of some member of the family. The physician who has a large office practice can have the assistance of an office attendant; or if this is impracticable, a modified self-retaining Sims' speculum may be used. See Figures 29 and 30.

Thomas, after long experience with other instruments, makes a statement something like this: "Learn the use of Sims' speculum, persevere in the method for three months, and you will never give it up." Emmet, whose experience with the instrument is, perhaps, greater than that of any other, says: "Dr. Sims' instrument has been modified in various forms, and new ones have been invented on the same principle, with the view of dispensing with an assistant; but,

as yet, nothing has been devised which can take its place. This instrument is so simple in design, and so perfectly does it fulfil every requirement, that it will probably never be superseded.

"As long as the sole use of the speculum was to bring the cervix into view, and to facilitate the passage of the porte-caustique in the treatment of supposed ulceration, the cylindrical speculum sufficed. With the advance of knowledge in the treatment of uterine disease, it became necessary to gain more space and light. The cylindrical speculum was therefore gradually superseded by various instruments

FIGURE 28.



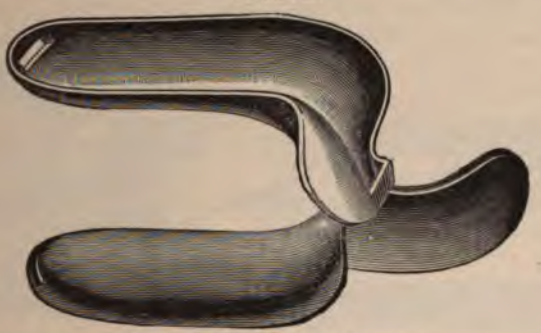
Sims' speculum and depressor.

with expanded blades to open out the upper portion of the vagina, but nearly every speculum of the kind that I have seen is so long that it displaces the uterus more or less, and by continued use tends to dilate the upper portion of the vagina. I have known both retroversion and prolapse of the uterus to occur in this way from the repeated use of the valvular speculum. The amount of space and light obtained by any of these instruments is very small in comparison with what is afforded by Sims' speculum, and they are useless for all surgical procedures."

"The older members of the profession who have become dexterous in the use of some special instrument cannot be expected to change it for a new one, or to appreciate the necessity for doing so. But the younger practitioner should begin with Sims' speculum, if he wishes to hold a position in the advance. Full justice, in the light of our present knowledge, cannot be done in the treatment of uterine disease by any other instrument than this perineal retractor, or some other based on the same principle, and, like it, capable of exposing the whole vagina."

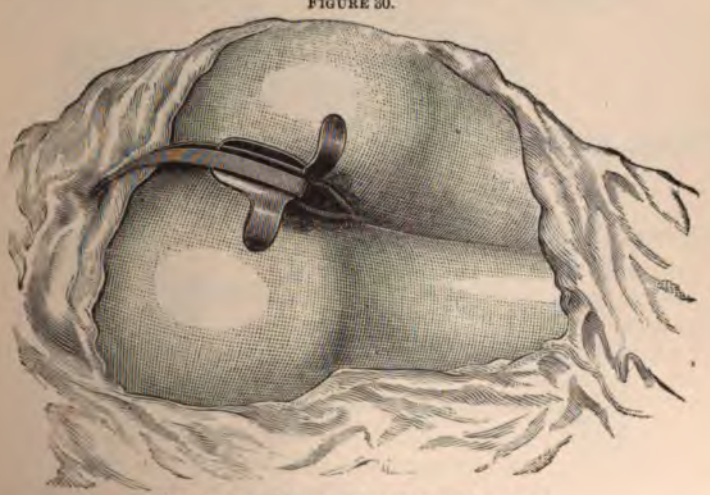
"In a single generation the use of this instrument has advanced the knowledge and treatment of the diseases and especially the injuries of women, from profound ignorance, to a front rank, if, indeed, not beyond that of any other branch of surgery."

FIGURE 29.



Cleveland's self-retaining speculum.

FIGURE 30.



Cleveland's self-retaining speculum in place.

The Self-retaining Sims' Speculum. Modifications of Sims' speculum to make it self-retaining have been devised by Emmet,

Cleveland, and others. They are all inferior to the original Sims' instrument, but superior to any one of the multiform cylindrical and bivalve instruments.

Cleveland's speculum is one of the best examples of its kind. As shown in Figure 30, it is held in place by a strap attached to the outer blade, by a slot at the inner end, and by the metal band between the blades. The strap passes up over the coccyx and sacrum to join a belt buckled around the waist. Traction by the strap on the speculum retracts the perineum. The blade has a flange for holding up the right buttock and labium.

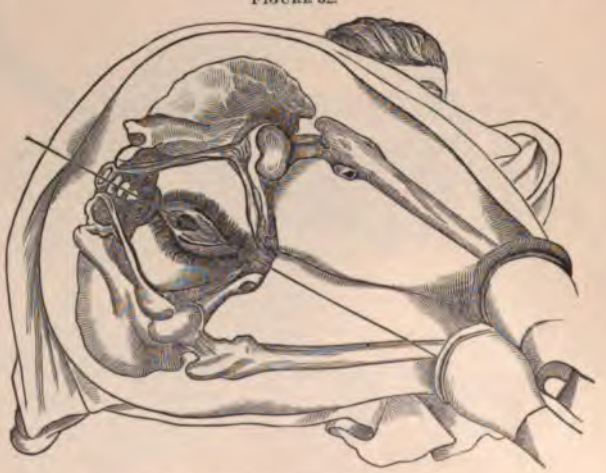
The Left Latero-prone Position. In order to appreciate the action of Sims' speculum it becomes necessary to study the effect of Sims'

FIGURE 31.

Incorrect representation of Sims' left latero-prone position.[1]

latero-prone position upon the pelvic organs. Like the knee-chest position, of which it is a modification, it causes the vagina to fill with

FIGURE 32.



Correct latero-prone position.[2]

air, and the anterior and posterior vaginal walls—or, to speak more

[1] After Leblond. From Thomas and Mundé, Diseases of Women.
[2] From Hegar and Kaltenbach, Operative Gynäkologie.

comprehensively, the pubic and sacral segments of the pelvic floor—to separate. The speculum then exaggerates the effect of this position by hooking or drawing back the perineum, which exposes almost the entire surface of the widely opened vagina, and causes the cervix to be drawn somewhat toward the vulva.

Two requirements are essential to the successful use of Sims' speculum—correct position of the patient and proper holding of the instrument. The patient is to be placed on the left side, the hips being over the left-hand corner of that end of the table which is toward the operator; the knees are to be drawn up toward the abdomen, and the right thigh flexed slightly more than the left. The patient's left arm rests behind her on the table. This permits the right shoulder to be thrown forward and depressed toward the right side of the table, so that the position becomes latero-prone,—that is, lateral and slightly prone at the hips, and almost wholly prone at the shoulders. The left side of the head rests upon the table, the face looking to the right. The right arm hangs over the right side of the table, and the long axis of the trunk extends obliquely across the table from left to right.[1]

FIGURE 33.

Patient in Sims' left latero-prone position and protected by towels. Ready for introduction of Sims' speculum.[2]

The steps of an examination with Sims' speculum are these:

1. Place the patient, the waist clothing being loose, in Sims' left latero-prone position, the head, not the shoulders, supported by a very thin pillow.
2. Protect the buttocks with the towels, Figure 33.
3. Let the nurse lift up the right labium, Figure 34.
4. Introduce one blade of the speculum and place the other in the nurse's hand.
5. With the depressor in the right hand, push the anterior vaginal wall forward until the cervix comes into full view.

[1] E. C. Dudley, in American System of Gynecology.
[2] After Davenport, Diseases of Women.

…grasp of the uterine dress…
…gnua that may be found.

FIGURE 35.

latero-
positio…

…mitted in order to
…assage of probe or

…e uterus other-
…e depressor to
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…dy the cervix
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…f the cervix,
…charges may
…their source,
…be observed.

Emmet's uterine dressing-forceps.

…is a perineal
…ter and flatter
…ual sizes, and are adjustable
…changed to meet the require-

air, and the anteri…

[1] After Le…
[2] From H…

ments of the case. It is a favorite instrument with German surgeons. It differs from Sims' chiefly in the manner of its use, which requires the patient to be in the dorsal position, and the thighs to be flexed in the lithotomy position. An objection to this instrument is that during the use of it the vesico-vaginal walls are liable to fall toward the speculum, and the lateral walls to fall together in such a way as to obscure the field of operation. To obviate this difficulty one uses a smaller though similar retractor which acts in the opposite direction, like the anterior blade of the bivalve speculum. Lateral depressors also are often required on either side. All of these are more or less

FIGURE 36.

Simon's specula: blades of various sizes and shapes.

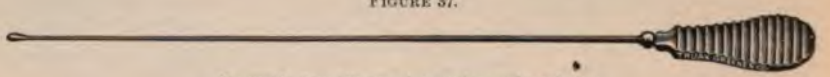
in the operator's way. The introduction of the sound, curette, or other instruments to the interior of the uterus is more difficult in the dorsal than in the Sims position; and if the organ be anteverted or anteflexed, the instrument is especially liable to be arrested at some point on the posterior wall of the cervix or at the internal os, and refuse to pass further. Simon's speculum is less easily held, and requires more assistants, more attachments and depressors, than Sims'; it gives less light and space, and for general diagnostic and surgical use, therefore, should seldom have the preference over the Sims' instrument. For vaginal hysterectomy and many other operations involving vaginal section the Simon instrument is preferable.

The Probe and Sound have already been mentioned in connection

with conjoined palpation as a means of diagnosis in tumors. In some cases the sound, and especially the probe, may be difficult or impossible to pass in the dorsal position, but may be readily passed with the aid of Sims' speculum in the lateral position.

To pass the probe or sound in the dorsal position without a speculum, first introduce the left index-finger to the os externum, then, on the finger as a guide, introduce the instrument into the os and let it find its own way, judiciously aided by slight force, to the fundus.

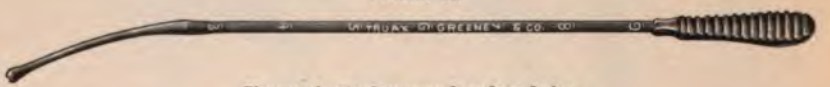
FIGURE 37.



Emmet's fine silver-wire probe, reduced size.

To pass the sound or probe through Sims' speculum first bring the cervix into view, seize it with a uterine tenaculum or with a small

FIGURE 38.



Simpson's uterine sound, reduced size.

vulsellum forceps, gently draw it toward the vulva, and pass the instrument, bending it before introduction to conform, as nearly as the surgeon can judge, to the direction of the canal. The forward traction of the uterus greatly facilitates the passage—in fact, is sometimes essential.

FIGURE 39.

Sounds of Simpson and Sims compared; sections of full size.

Dangers of the Sound and Probe. Numerous cases of grave infection following the use of these instruments have given rise to an impression that they are dangerous. The risk, however, is practically nothing if complete asepsis is maintained. Even a clean instrument may carry infection from the vagina or vulva; hence the necessity of

thorough asepsis of these parts. The sound without asepsis is more objectionable than the probe, for it is not only equally liable to be the

FIGURE 40.

First step: passing sound; patient in dorsal position without speculum; point of sound is guided along palmar surface of left index-finger to os externum.

carrier of sepsis, but is more liable to wound the sensitive endomètrium, and thereby open the door to microbic invasion. The passage

FIGURE 41.

Second step: passing sound; patient in dorsal position without speculum. As sound passes from os externum to fundus index-finger is moved from os externum to posterior vaginal fornix.

of the fine probe is usually painless. The sound in a sensitive, inflamed uterus may be intolerable.

The diagnostic value of the sound and probe is sometimes very great. One may, for example, be unable to locate the uterus except by the direction which the sound takes. The tortuosity of the canal, moreover, may at once show the relations of a myoma to the uterus. Again, the length of the canal in a myomatous uterus is increased, but not materially increased, by the presence of ovarian and other extra-uterine tumors. The case, however, is rather exceptional in which the sound or probe is a necessary means of diagnosis. The more experience one has, the more educated one's touch, the less one will need to use these instruments for diagnostic purposes.

Uterine Dilatation may be accomplished in the following ways:

1. By graduated bougies, or sounds, after the method of dilatation of the male urethra.
2. By instruments of diverging blades constructed on the principle of the glove-stretcher.
3. By water dilators.
4. By tents.

Dilatation is more frequently required for therapeutic than for diagnostic purposes. The object of diagnostic dilatation is to open the endometrium in order that by means of the curette a specimen may be removed for microscopical examination, or in order that the finger may be used for intra-uterine digital touch. The technique is the same for diagnostic as for therapeutic dilatation. See, therefore, a description of the latter in Chapter V., on Minor Operations.

Diagnostic Curettage. The object of diagnostic curettage is to remove enough diseased tissue for microscopical or other examination. If the curette is small, and the os is patulous, curettage is sometimes possible without anæsthesia or previous dilatation. Usually, however, the procedure requires both. Microscopical examination of the scrapings is frequently the only means of differentiation between hemorrhagic endometritis, the remains of abortion, post-abortum endometritis, carcinoma, and sarcoma. The technique of curettage is described in Chapter V.

The Exploratory Needle and Aspirator have the same diagnostic and therapeutic significance in gynecology as in other departments of surgery—*i. e.*, the removal of fluid. The contents, for example, of a sactosalpinx, a renal cyst, a pelvic abscess, or an ovarian cyst may be removed for visual, chemical, or microscopical examination.

The uses of the stethoscope and microscope will, as the occasion requires, be mentioned in the diagnosis of special diseases.

Examination of the Anus and Rectum.

Rectal touch and eversion of the anus by means of the finger in the vagina have already been noticed in the earlier pages of this chapter. Numerous specula have been devised for inspection of the interior of the rectum. For examination of the lower part of the rectum, Sims' speculum is immeasurably superior to all others. It is used for this purpose the same as for vaginal examination—*i. e.*, with the patient in the left latero-prone position.

The Proctoscope and Sigmoidoscope. The frequent association or confusion of rectal disease with the diseases of women may render necessary the inspection of the upper part of the rectum; for this purpose Kelly uses a tubular speculum, called a proctoscope, about 1

FIGURE 42.

Proctoscope 8 inches long and 1 inch wide. The sigmoidoscope is the same except in length, which is 14 inches. The instrument is provided with an obturator; it is in nearly all respects except size identical with the cystoscope shown in Figure 51.

inch in diameter and 8 inches long. For still higher examinations he uses the sigmoidoscope of the same diameter, but 14 inches long. The patient is examined in the knee-breast position, the same position as is used in cystoscopy, Figure 57, and the light is thrown in by a head-mirror. Examination through these instruments is most satisfactory.

Examination of the Urinary Organs.

The means of examination are these:

1. Urinalysis.
2. Palpation and percussion.
3. Cystoscopy and ureteral exploration and catheterization.
4. Segregation of urine.

1. Urinalysis.

The study of the urine involves, first, chemical examination; second, microscopical examination.

FIGURE 43.

Urethral dilator. Underscored numerals indicate diameters in millimetres.

FIGURE 44.

Gum ureteral catheter; 35 to 50 cm. long.

The chemical examination will show changes in the proportion or

quality of solids, and will suggest the possible relation of these changes to pathological conditions and functional disorders. For example, decrease in urea may signify nephritis. Abundance of uric acid would indicate that more exercise and less nitrogenous food should be taken. Excessive acidity would account for irritation of the bladder and frequent urination. The microscopical examination may prove and locate the existence of disease in either the kidney, ureter, or bladder.

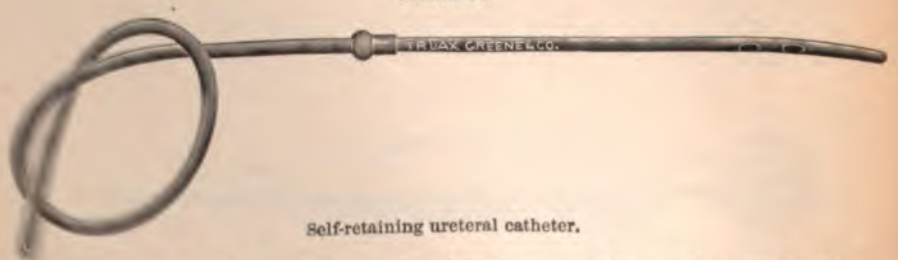
2. Palpation and Percussion.

Palpation and percussion over the hypogastrium may give strong evidence of distention of the bladder; further evidence would be the bulging of the anterior vaginal wall toward the vulva, and constant dribbling of urine. The evacuation of a large quantity of urine through the catheter would be proof.

FIGURE 45.

Evacuator. Used for withdrawing residual urine.

FIGURE 46.



Self-retaining ureteral catheter.

Palpation with conjoined examination may show a tumor in the bladder. Vaginal and rectal touch may also give much information relative to the urethra, bladder, and ureter. Vaginal touch will enable one to judge of sensitiveness in the urethra and neck of the bladder. In the anterior wall of the vagina to either side of the

FIGURE 47.

FIGURE 48.

FIGURE 49.

FIGURE 50

Figure 47.—Ureteral searcher.
Figure 48.—Ureteral catheter. Without handles, for direct catheterization through speculum.
Figure 49.—Delicate mouse-toothed forceps.
Figure 50.—Ureteral catheter with handle, plug, and chain.

median line the ureter may often be felt as it passes in a posterior and lateral direction on either side of the cervix toward the kidney. It is normally a flattened, cord-like, soft, yielding band. Pathological changes often make it easier to recognize as a hard, round, larger, more resisting cord. A bougie introduced through the urethra into the ureter facilitates the palpation. Tenderness along the line of the ureter indicates inflammation; this inflammation of the ureter, when unrecognized, often leads to disappointment in the treatment of cystitis.

The interior of the bladder may be palpated by the sound or by the finger. The sound enables one to judge of the presence or absence of a stone or a tumor. Vesical hemorrhage following the introduction of the sound indicates the possible presence of inflammation or of a tumor. Palpation by the finger through a dilated urethra is to be condemned, for two reasons: first, it gives no information which cannot be better obtained by means of the cystoscope; second, permanent incurable incontinence of urine from injury to the urethra occurs in about 3 per cent. of the cases. Digital exploration, if made at all, should be made through an artificial vesico-vaginal fistula, opened for the purpose. See Cystotomy for Cystitis.

Inspection. The presence or absence of cystocele, urethrocele, prolapse of the urethra, inflammation, and new growths about the meatus may be recognized by direct visual examination. See Inflammation of Skene's Glands, under Vulvo-vaginitis.

3. Cystoscopy and Ureteral Exploration and Catheterization.

There are two classes of cystoscopes: they are

The cylindrical cystoscope;

The electrical cystoscope.

The Cylindrical Cystoscope. Numerous instruments have been devised for the inspection of the interior of the bladder. It is the great merit of Dr. Howard Kelly to have popularized and perfected an effective and satisfactory means of intravesical inspection. The following is an adaptation from the description given by Dr. Kelly:[1]

The essential features of the method are:

1. Atmospheric dilatation of the bladder induced by posture.
2. Introduction of a simple straight speculum without fenestrum.
3. Examination of the interior of the bladder and urethra by reflected light.

The instruments required are:

1. A good light and a head mirror.
2. A urethral dilator, Figure 43.
3. A vesical speculum with an obturator, Figures 51, 52, and 54.
4. A suction apparatus to empty the bladder, Figure 45.
5. A long mouse-tooth forceps, Figure 49.
6. A searcher for discovering the ureteral orifice, Figure 47.
7. Two ureteral bougies.
8. Two ureteral catheters.

[1] Diseases of the Female Bladder and Urethra. Johns Hopkins Hospital Bulletin, November, 1893. American Journal of Obstetrics, January, 1894.

The speculum in most common use has a diameter of one centimetre. If urethral dilatation to this extent is painful, one may produce local anæsthesia by the application of a 10 per cent. solution of

FIGURE 51.

No. 16 cystoscope. Actual size.

cocaine. This may be applied within the meatus on a uterine applicator wound with cotton. In cases requiring more dilatation and in very nervous cases, general anæsthesia, especially in the first examination, may be necessary.

The full special set of numerous graduated instruments formerly used to dilate the urethra is unnecessary. Stretching of the meatus by the conical dilator alone has been found sufficient.

FIGURE 52.

No. 10 cystoscope. Actual size.

FIGURE 53.

Cystoscope without obturator.

A full set of specula comprises various sizes ranging in diameter from 5 mm. to 20 mm.—one-fifth to three-quarters of an inch. The latter, according to Simon, is the outside limit of safe dilatation. For some urethras it is doubtless beyond the limit.

The position of the patient is the chief essential. It may be the dorsal or the knee-breast position. Figures 55 and 57.

For examination in the dorsal position the hips of the patient must be elevated about twelve inches above the plane of the table. The speculum now being introduced through the urethra, the air rushes in and balloons the bladder. The residual urine must be removed by means of the suction apparatus. The entire interior of the bladder may then be examined by light reflected from a head mirror. The examination is best made in a dark room by artificial light. The Argand burner or electric light is most serviceable.

The extent of surface seen at one time will depend upon the distance of the eye from the cystoscope, as well as upon the diameter of the instrument and its nearness to the field of vision. By sweeping the cystoscope from side to side, up and down and around, all parts

FIGURE 54.

Hand holding cystoscope in act of introduction.[1]

may be rapidly and successively brought to view. One may observe and identify a wide variety of pathological conditions, such as neoplasms, inflammation, ulceration, scars, dilated vessels, discoloration, and foreign bodies. The most significant points for observation are the trigone and the openings of the ureters.

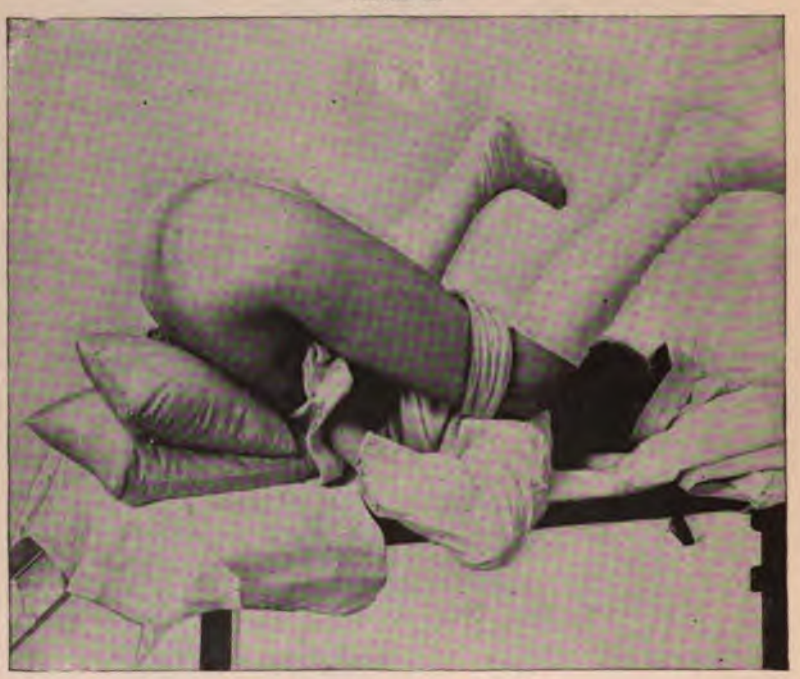
To expose the trigone, withdraw the speculum until the mucous membrane of the inner extremity of the urethra begins to close over it; then advance it and slightly depress the outer end. The mucosa

[1] Kelly. Diseases of the Female Bladder and Urethra. Twentieth Century Practice.

at this point is usually of a dark-pink color, in contrast to the lighter glistening appearance of the surrounding surfaces.

To expose the ureters, let the end of the speculum project into the bladder one centimetre, with its handle raised. The inter-ureteric ligament may now in some cases be seen by its slightly raised transverse fold or by its distinct difference in color. A ureteral orifice should now be seen by turning the speculum about thirty degrees to either side. By continuous watching, little jets of urine will be seen to spurt from the ureteral opening at intervals of about a minute. The appearance about the ureteral opening is variable. It may only be recognized by the periodic spurts of urine. It may be seen with the greatest difficulty only as a fine slit in the mucosa. The opening may be in a slight depression—a pit or dimple. In some inflamma-

FIGURE 55.



Dorsal position. Elevated pelvis.[1]

tory cases the opening may be through an eminence of soft granular tissue or through the apparently everted ureteral mucosa. If the ureteral orifice is in view, the searcher will readily pass an inch or more into the duct. The ureteral catheter on one or both sides may now be introduced, and the urine taken directly as it flows from the kidneys. This may insure unerring diagnosis of the condition of either kidney. If the question of the removal of one kidney is under consideration, it is clearly of the greatest advantage to know the exact or approximate condition of the other.

[1] Kelly. Diseases of the Female Bladder and Urethra. Twentieth Century Practice.

The beginner will often have great difficulty in finding the ureter. Even the experienced surgeon often fails. The difficulty, however, always decreases with intelligent practice.

Examination in the Knee-breast Position. In many cases, especially of stout women, in which the bladder does not readily balloon with air in the dorsal position, it will do so in the knee-breast position. Figure 57 shows the ordinary knee-breast position. Figure 58 shows this position modified. This modification, with the buttocks directly over the calves of the legs or ankles, instead of vertically over the thighs, has been found by Kelly to yield better results, both in difficult and in simple cases.

The examination is conducted on the same principles as in the

FIGURE 56.

Introducing searcher into left ureteral orifice.[1]

dorsal position. Examination in this position requires the end of the cystoscope to be cut off obliquely, instead of transversely.

The Electrical Cystoscope. This is sometimes called the pan-electroscope; it was invented by Leiter, of Vienna, and later improved by Casper. Both of these cystoscopes carried the electric light ray into the bladder by means of refracting prisms at the exter-

[1] Kelly. Diseases of the Female Bladder and Urethra. Twentieth Century Practice.

nal end of the tube. The final development of this instrument began with Nitze in 1876. He placed the electrical vacuum light at the inner extremity of the tube in such a manner as to give direct illumination and to transmit to the eye through a series of lenses an exact picture of the bladder mucosa magnified. In all these instruments the electric current is furnished by a battery from which insulated conductors pass through the tube to and from the lamp. This instrument is used with the bladder filled with water and the

FIGURE 57.

[illegible] position; cystoscope introduced; sound shows position of anal orifice.[1]

[illegible] in the dorsal position. Four conditions are essential to the [illegible] of the Nitze electrical cystoscope:

1. [illegible] of the urethra—5 mm.—sufficient to permit the [illegible] of the instrument.
2. [illegible] of the bladder must be sufficient to hold not less [illegible] of injected fluid.
3. [illegible] must have the power to retain the injected [illegible].
4. [illegible] must remain transparent, and not become [illegible] of blood or mucus.

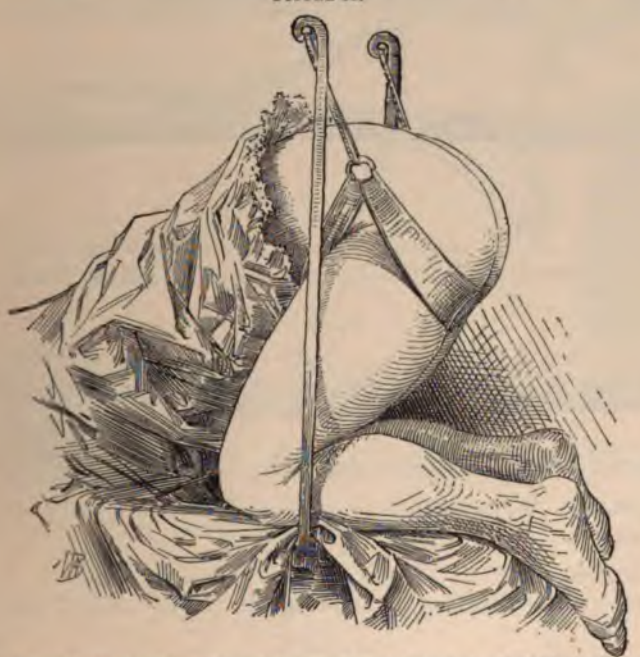
[illegible] and Urethra. Twentieth Century Practice.

Advocates of this method claim superiority over the Kelly method for the following reasons:

1. General or local anæsthesia is less often necessary.
2. The more convenient lithotomy position is used instead of the knee-breast or Trendelenburg position.
3. The bladder is more satisfactorily distended by water than by air.
4. The urethra is less widely dilated.
5. The examination requires less time and less skill, and requires no assistant.

It is evident that the Nitze cystoscope and the modifications of it, such as Casper's, must give way to the Kelly instrument when the

FIGURE 58.



Modified knee-breast position, often yielding better distention of bladder than with thighs vertical. The straps are unnecessary. The patient may, even under ether, be readily held and balanced by an assistant during the exploration.[1]

sphincter vesicæ will not retain the injected fluid, when the injected fluid becomes turbid and bloody, and when the bladder is so contracted that it fails to distend sufficiently.

Comparison of Cystoscopes. Cystoscopy and ureteral exploration in women, owing to the shortness and dilatability of the urethra, may be satisfactorily accomplished by means of the simple Kelly cystoscope already described. In examinations of the male urethra the prismatic electroscope, on account of its magnifying power and the greater distance of the field of inspection from the eye, is indispensable.

[1] Kelly. Diseases of the Female Bladder and Urethra. Twentieth Century Practice.

Value of Cystoscopy. By means of the cystoscope the entire interior of the bladder may be brought into view; foreign bodies, tumors, and other pathological changes may be recognized, and the ureters and the pelves of the kidney may be catheterized or otherwise explored. The instrument has often revealed the presence of stones, tumors, and ulcers which had entirely escaped detection by the sound. Numerous cases in which cystitis is of only secondary importance to other associated lesions, such, for example, as tumors, tuberculous ulcers, piles, or hemorrhoids of the bladder, are now daily observed by the cystoscope.

Cystoscopy is of great value in preventing blind and meddlesome treatment for a class of cases which present the subjective symptoms of cystitis, but in which inspection fails to show any lesion whatever of the bladder mucosa.

FIGURE 59.

Nitze's cystoscope.

The value of the instrument is incalculable when only limited areas are diseased, as, for example, in the mild inflammations of the

FIGURE 60.

Casper's cystoscope. The instrument is provided with a guide for the passage of the ureteral catheter.

trigone and in fissure at the neck of the bladder. Under such conditions the operator, instead of treating the entire vesical mucosa by

FIGURE 61.

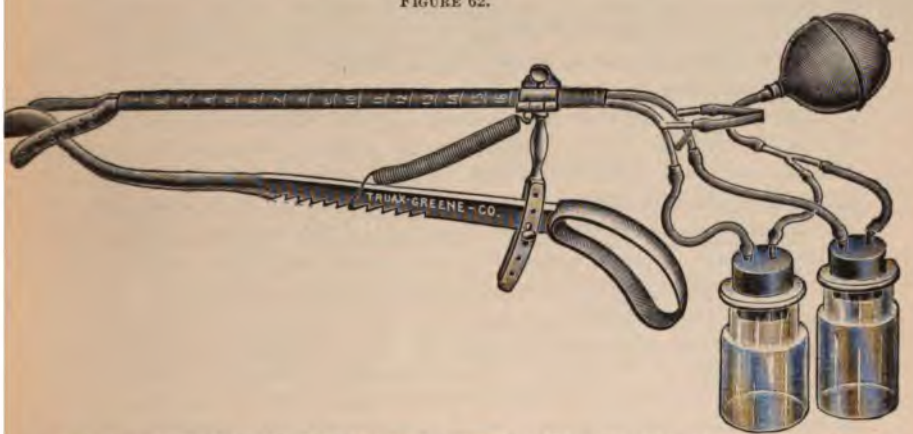
attachments and with its two catheters in contact with one another ready to be inserted into the bladder.

injections more or less strong, may direct to the diseased application which may be indicated.

Another instrument of great importance is the it collects the urine directly and separately as it ureter into the bladder. The instrument has two over the ureteral catheter: first, unlike that instruavailable for the non-expert; second, it does not invade

and therefore cannot infect the ureters. The instrument consists of two catheters, their straight portions being inclosed in a flattened tube, and each being separate and movable on its longitudinal axis. Figure 61 shows the tube graduated to 19 centimetres and enclosing the two catheters. Their vesical ends protrude to the right and their outer ends to the left. The mechanism is such that, the instrument having been introduced into the bladder, the two catheters may be rotated upon their long axis so that their curved bladder-ends will

FIGURE 62.



Segregator with the ends of the catheter separated, as they appear after introduction into the bladder. The dotted lines show the lever which raises the bladder-wall between the separated catheters and thereby forms a watershed. A bottle is attached by a rubber tube to each catheter to receive the urine.

lie as indicated in Figure 62, one on one side and the other on the other side of the trigone. A metallic lever, Figure 63, is introduced into the vagina of the female, or the rectum in the male, and attached to the shaft of the instrument. This lever is indicated in

FIGURE 63.

The watershed lever detached from the catheters.

the lower part of Figure 62. It is attached to the catheter tube by means of a forked metallic appliance, and held up by a spiral spring; the function of it is to elevate that portion of the bladder which lies between the two separated ends of the rotated catheters and thereby to form a watershed. The urine as it drops on either side from each ureteral orifice is now separated and flows out through the catheter on the corresponding side. Each catheter is continued by a rubber tube to a bottle for the reception of urine. The bottles are

provided with a rubber suction bulb which may serve to create a partial vacuum and thereby to attract the urine. Before using the segregator one should carefully study the directions of the inventor, which accompany the instrument.[1]

The value of this instrument depends not only upon the fact that without ureteral catheterization we are enabled by its use to separate the urine of the one kidney from that of the other, but also upon the fact that we temporarily, as it were, eliminate the bladder from the urinary tract. In cases of a diseased kidney one may demonstrate the presence or absence or ascertain the condition of the other kidney, and thereby avoid the not unknown post-mortem embarrassment of finding it either absent or useless from disease.

It is necessary to a correct diagnosis of cystitis, for example, that we know what abnormal constituents in the urine have their origin within the bladder itself. Normal urine suffers no change in a normal bladder free from microbes; hence a comparison of analyses of urine, taken from the bladder, with urine taken directly from each kidney, may at once indicate the exact location of the disease. There may be present the subjective symptoms of cystitis—that is, pyuria, painful and frequent urination, and ammoniacal urine—and yet the bladder may be free from disease.

The points to be observed in urine thus obtained are the reaction and the presence or absence of pathological products, such as pus, blood, epithelial cells, bacteria, and crystals. The reaction of the urine should be taken at once, as secondary changes sometimes occur quite rapidly. If urine taken directly from the kidneys possess a normal degree of acidity, while that from the bladder be alkaline, it is very evident that the pathological process producing the alkalinity must reside within the bladder. If urine from the kidneys be free from pathological products, while that from the bladder contains pus, epithelium, or bacteria, the involvement of the bladder is unquestionable.

Exploratory Incision.

When other means of diagnosis have failed, and it is necessary to examine the pelvic or abdominal organs directly by touch or by sight, the surgeon will for that purpose open the peritoneum by exploratory incision. The incision is made either through the vagina—vaginal section, or through the abdomen—abdominal section. The incision having been made, the finger is introduced, and the diagnosis made by direct touch. The section may, if necessary, be enlarged so as to bring the pelvic and abdominal contents into view. Simple touch, however, through the incision only large enough to admit the finger, is always safer and usually gives more information than visual examination. All vaginal and abdominal sections should be first exploratory. These sections are described in the chapter on the Treatment of Pelvic Inflammation.

[1] Harris. Transactions of the Chicago Gynecological Society, November, 1898; and Medicine, April, 1898.

CHAPTER IV.

LOCAL TREATMENT.

THE principal procedures in local treatment are these:

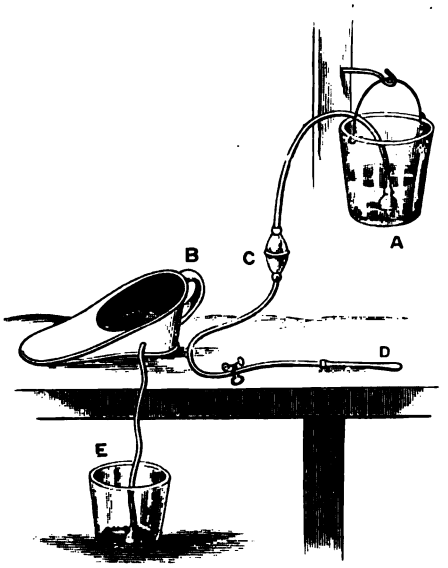
1. The hot-water vaginal douche.
2. Tamponade.
3. Topical applications.

1. The Hot Vaginal Douche.

The choice of the syringe, the frequency of the douche, the time and length of each application, the temperature of the water, the proper use of the bed-pan, the position of the patient, and long persistence in the treatment, are all essential to good results.

The small fountain-syringe, in general use, requires refilling several times during the application of the douche, and is therefore inadequate.

FIGURE 64.



Lord's douche apparatus.

The common bed-pan, since it must be frequently emptied, is likewise unsatisfactory. A simple device, known as Lord's[1] douche apparatus, is free from both of these defects. See Figure 64.

[1] Dr. F. H. Lord, Plano, Illinois.

It consists of a bucket, A, large enough to hold two or three gallons of water, suspended on a hook about four feet above a couch on which rests the large bed-pan, B; a soft rubber siphon, ACD, having at A a weight heavy enough to retain that end of the siphon in the bottom of the bucket A; an ordinary soft-rubber syringe-bulb at C; a device for shutting off the current between C and D, and a female syringe-tube at D. Another rubber tube is attached to an opening in the bed-pan and leads to the bucket E.

Directions. The bucket A is to be filled with water of the proper temperature, the shut-off being closed. The patient is then to be placed upon the bed-pan in the proper position, the tube D to be inserted into the vagina as far as it will pass, the bulb C to be compressed once or twice, and the shut-off opened. The water will then flow through the siphon without compression of the bulb, fill the vagina, overflow into the bed-pan, and pass thence into the bucket on the floor below. Commonly it may be more convenient to place bucket A upon a shelf than to suspend it. The couch should be of some unyielding material, otherwise the bed-pan will settle so low as to prevent the drain of water into bucket E.

The following is designed to impress the importance of strict observance of detail in the application of the douche. In no other manner will its good effects be realized:

Ordinary method of application.	*Proper method of application.*
I.	I.
The douche is applied with the patient in the sitting posture, so that the injected water cannot fill the vagina and bathe the cervix uteri, but instead returns along the tube of the syringe as fast as it flows in.	The douche should invariably be given with the patient lying on the back, with the shoulders low, the knees drawn up, the hips elevated on a bed-pan, so that the outlet of the vagina may be above every other part of it. Then the vagina will be kept continually overflowing while the douche is being given.
II.	II.
The patient is not impressed with the importance of regularity in its administration.	It should be given at least twice every day, morning and evening, and generally the length of each application should not be less than twenty minutes.
III.	III.
The temperature is not specified or heeded.	The temperature should be as high as the patient can endure without distress. It may be increased from day to day, from 100° or 105° to 115° or 120° Fahr.
IV.	IV.
The patient abandons its use after a short time.	Its use, in the majority of cases, should be continued for months at least, and sometimes for two or three years. Perseverance is of prime importance.

An [illegible] for the bed-pan may be made as follows: [illegible] ordinary bed place two chairs with space enough [illegible] the lower bucket; spread a rubber sheet over [illegible] that one end of the sheet may fall into the bucket [illegible] The douche may then be given with

the patient lying across the bed, the hips resting over the edge of the bed and one foot on each chair. The water will find its way along the rubber trough into the bucket below.

Modes of Action. The douche acts in a twofold way:

1. As a vasomotor stimulant.
2. As a cleansing agent.

1. **Vasomotor Stimulant.** Emmet, the strongest advocate of the douche, attributes its good effects to the stimulating influence of the hot water on the vasomotor nerves. The nerves are stimulated, he says, by reflex action, and the dilated congested vessels are thereby made to contract. In this way congestion is said to be lessened, absorption of morbid products hastened, and local nutrition improved.

2. **Cleansing Agent.** The vagina in pelvic inflammation is a passage-way, and to some extent a receptacle, for pathological secretions. These secretions flow into it from the uterus, the Fallopian tubes, pelvic abscesses, and from the vaginal mucous membrane itself. Unless kept clean, the vagina may become an incubator and a distributing point for bacteria. The value of the douche, therefore, as a means of asepsis, is self-evident. When local disinfection is required, the hot-water douche may have in solution some antiseptic substance, such as lysol, carbolic acid, corrosive sublimate, boric acid, salicylic acid, or peroxide of hydrogen.

The Indications for the douche, as suggested in the foregoing paragraphs, are chiefly in the treatment of chronic pelvic inflammations. The power of heat to stimulate and contract bloodvessels makes the douche also useful in the treatment of uterine hemorrhage. The prevailing disposition to extend the use of it to the routine treatment of all pelvic disorders should be discouraged.

Contra-indications and Dangers. The douche should not be given during menstruation for fear of exciting pelvic congestion, nor during pregnancy for fear of setting up uterine contractions. In the presence of a bleeding cancer or sarcoma of the cervix caution is required to avoid hemorrhage. In some cases of patulous Fallopian tubes the douche fluid may be forced into the uterus, through the tubes and into the peritoneal cavity, with most serious results.

There are constantly present in the normal vagina great numbers of lactic acid bacteria whose function is to render the vaginal secretion acid, and therefore to make it an unfit culture-ground for about 90 per cent. of all pathogenic bacteria. The washing out of these normal germs and their acid secretion necessarily makes the vagina a less difficult barrier for disease-germs to pass, and therefore opens the way for infection in the higher zones of the pelvis. The indiscriminate routine use of the douche in the normal vagina is for this reason of questionable propriety.

2. Tamponade.

The principal indications for tamponade are:

1. Inflammation.
2. Hemorrhage.

1. **Inflammation.** Tamponade in the treatment of inflammation is designed, according to the indication and manner of application, to fulfil one or more of three purposes. It may be used: A, as a means of pressure; B, as a vehicle for the application of medicinal substances; C, for drainage.

A. The pressure-effect of the tampon is chiefly useful in the treatment of displacements, especially displacements due to inflammatory causes. The subject will be further discussed under the head of Pelvic Inflammations and Displacements.

B. As a vehicle for the introduction of medicaments the vaginal tampon has become a routine factor in gynecology. It is most frequently used as a carrier of glycerin. The object sought is to cause a watery discharge from the genital tract, and thereby to deplete the vessels and overcome congestion. Good results have often followed this treatment. How far they should be attributed to the tamponade, and how far to the curative forces of nature, or to the associated systemic treatment, it is often difficult to say. If the tampon is left in for more than twenty-four hours, it becomes offensive, and may become a hotbed of infection; hence, if used at all, it should be renewed daily. The therapeutic value of the tampon has been much overestimated.

C. Drainage of the endometrium for endometritis, by means of the intra-uterine tampon of aseptic or antiseptic gauze, has been with many a favorite means of treatment. See chapter on Treatment of Endometritis.

2. **Hemorrhage.** Hemorrhage from the vagina may often be controlled by means of a tight vaginal tampon. It is, however, better to find the bleeding-point and secure it by more definite surgical means.

Uterine hemorrhage, whether from endometritis, uterine tumors, or abortion, may demand immediate control. The vaginal tampon is most commonly used for this purpose. It is, however, a cumbersome measure, and in bad cases often fails. Great distention of the vagina by a large tampon interferes with the functions of the bladder and rectum, and is a mechanical cause of discomfort.

Intra-uterine tamponade is the most practical and the most effective treatment for uterine hemorrhage. It should be in the form of a continuous strip of aseptic or antiseptic gauze about two inches wide. The cervix having been exposed by a Sims speculum and steadied by a vulsellum forceps, the strip is introduced by means of a slender dressing-forceps, sound, or similar instrument. The secretions absorbed by the tampon decompose rapidly, and become a prolific source of infection; hence the gauze should be renewed daily or every two days.

Material for the Tampon. If elastic pressure is required, fine lambs' wool is superior to absorbent cotton. For other purposes the continuous strip of aseptic gauze is preferable to either.

3. Topical Applications.

Applications to the Endometrium.—Intra-uterine medication commonly results in failure and disappointment, for two principal reasons: first, it often is used in unsuitable cases; second, even though the cases be suitable, it often is used improperly.

Efficient intra-uterine medication requires that the medicinal substance be brought in contact with the uterine mucosa. Ordinarily the medicament is carried into the endometrium when that cavity is full of uterine secretions. These secretions form a thick protective coating over the mucosa. The application mixes with and may exhaust its virtue in chemical combination with the secretions, but does not reach the diseased mucous membrane. It frequently occurs that the applicator at various points inflicts slight wounds upon the endometrium, and thereby opens the door to septic invasion. Pelvic infection may be the result. The treatment, therefore, unless carefully applied, may be dangerous.

The prerequisites to safe and efficient intra-uterine applications are: first, a clear indication and definite appreciation of what the application is to accomplish—that is, the case must be properly selected; second, preparatory disinfection of the vulvo-vaginal surfaces and dilatation and cleansing of the endometrium; the disinfection is specially essential as a precaution against infection.

The Proper Selection of Cases will exclude, at least, three large classes of cases:

A. Those in which the increased uterine discharge is due not to local, but to general systemic disorders, such as cholæmia, malaria, diabetes, and gout. Under such conditions the remedy should be not local, but general, and the case should be referred not to the surgeon, but to the physician. The disappearance of such a discharge during local treatment should be attributed not to the meddlesome applications, but to the associated systemic treatment or to the curative force of nature.

B. Those in which the parametria and other circum-uterine structures are infected, or in which there is a uterine or extra-uterine tumor, or some other anomaly which would render topical applications useless or dangerous. This class of cases should be referred to the surgeon.

C. Those in which the uterine discharge is due to some non-infectious local irritant of non-bacterial origin, such, for example, as temporary uterine displacement from an over-crowded bowel or an over-distended bladder. When the local irritation is removed, the disorder usually disappears.

For selected cases in which the uterine mucosa is the subject of uncomplicated bacterial infection, or in which the complications are not such as to contra-indicate intra-uterine medication, it may be wise to introduce medicinal substances to the endometrium; the steps of procedure will have to be as follows:

1. The preparatory dilatation (unless the uterine canal is already quite open) and cleansing by irrigation having been made, expose the cervix by means of a speculum, preferably Sims'.

2. Seize the cervix by means of a small tenaculum, or tenaculum-forceps, in the left hand, and hold the cervix steady.

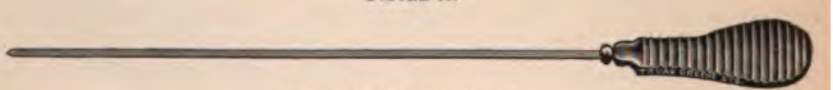
3. With the right hand pass the applicator, wound with cotton which has been saturated with the required medicament, into the uterine canal; or if it be desired to use intra-uterine injections, the fluid to be injected by means of a suitable intra-uterine syringe.

Many patients will not tolerate the necessary dilatation without anæsthesia; hence, intra-uterine medication as an office procedure must be restricted. Within the limitations above outlined, it becomes in many cases a surgical measure, and as such is no longer a potent cause of pelvic infection. The general subject of uterine applications is more fully set forth in Chapter XVII.

It follows from the above that a very large proportion of the women who were formerly made the subject of extensive intra-uterine treatment should be treated rather by medical or surgical means, or by both combined. Many cases of excessive uterine secretion which do not present well-defined indications for surgical treatment should be relegated to the field of internal medicine. The legitimate field for routine topical applications to the uterus is limited. Some gynecologists restrict intra-uterine medication almost entirely to supplemental treatment after curettage, when a limited number of disinfecting irrigations or applications may be useful.

The use of bougies containing various medicaments, the introduction of intra-uterine suppositories, the injection of various fluids into the uterus, the packing of the endometrium with gauze, and other similar procedures, will, according to their value, be presented, or omitted, under the treatment of special disorders.

FIGURE 65.



Emmet's silver applicator.

Applications to the Vulva or Vagina, including the vaginal portion of the uterus, are indicated for the cure or palliation of the various inflammatory affections of those organs. Ointments, lotions, douches, and strong caustics may be applied precisely as they would under similar conditions to other parts. See Treatment of Vulvo-vaginitis, Chapter XI.

Direct treatment to the urethra, bladder, and ureters will be discussed in Chapter XXIV., on Inflammation of the Urinary Organs.

Other forms of local treatment, such as scarification, leeching, and electro-therapeutics, will, according to their merits, be presented in connection with special subjects.

CHAPTER V.

MINOR OPERATIONS.

THIS subject involves a consideration of the preparatory treatment, the operating-table, anæsthesia, instruments, appliances, sutures, ligatures, dressings, the time and place of operation, assistants, operative technique, and after-treatment.

Preparatory Treatment.

The preparation for an operation, largely a matter of antiseptics and asepsis, is set forth in Chapter II.

Faulty nutrition from any causes, such as syphilis, gout, rheumatism, nephritis, diabetes, and purpura, may interfere with the success of an operation, and may therefore call for systemic and hygienic treatment.

Operating-tables.

For vaginal operations the table should be approximately forty-eight inches long, twenty-four inches wide, and twenty-seven inches high. Operations in private houses are usually performed on the common kitchen table or laundry table, or upon the narrow dining-table. The length of the table should not be greater than that given above, for when the thighs are flexed and the patient drawn toward the operator the head should not be too far from the anæsthetizer, who stands at the end of the table opposite the operator. While the patient is being anæsthetized the feet and legs may rest temporarily on a chair or small stand at the foot of the table. This is removed when the thighs are flexed, just before the operation begins.

Clover's Crutch is one of the best of numerous devices to hold the thighs flexed and the legs in position during those vaginal operations which are done with the patient in the dorsal position. Such an apparatus is convenient, but unnecessary. The knees may be readily held by two assistants, one on each side.

Acute synovitis of the knee-joint followed by anchylosis has occasionally been observed to follow vaginal operations. This was unexplained until E. H. Webster, of Evanston, Illinois, suggested that an assistant, while holding the thighs in this flexed position, might carelessly throw his weight upon the leg, or lean heavily upon it, and thereby flex the joint to a dangerous degree.

All gynecological tables, whether used for examination or operation, should be made as suggested in Chapter III., with an inclina-

tion of three or four inches, the foot of the table being to that extent above the head.

The accessories to the operation table include knee-rests, rubber sheets, and smaller tables for instruments, dressings, and ligatures.

Anæsthesia.

The choice and mode of administration of anæsthetics in gynecology follow unmodified the general principles of surgery.

Ether and Chloroform. In the absence of heart or kidney lesions the operator, according to his preference, is justified in the choice of ether or chloroform. Ether is preferred generally in cases of heart disease, and chloroform in cases of kidney disease.

Local Anæsthesia by Cocaine. A solution of cocaine injected hypodermically will produce local anæsthesia in the infiltrated tissues for a distance of about one-half inch from the needle puncture. The 1 per cent. solution is commonly used; a sufficient quantity of this solution to produce satisfactory anæsthesia—one to two grains—has given rise repeatedly to alarming depression in the circulation and respiration—so alarming as to call for the strenuous use of whiskey, strychnine, and nitroglycerin. The cocaine solutions of Schleich are designed to produce local anæsthesia with less cocaine, and thus to minimize the danger; they are made in three strengths as follows. The basis of the solutions is:

Distilled water, 1000 parts;
Sodium chloride, 2 parts;
Morphine hydrochlorate, $\frac{1}{4}$ part.

To the above solution is added cocaine hydrochlorate:

$\frac{1}{100}$ of 1 per cent. for the weaker solution;
$\frac{1}{10}$ of 1 per cent. for the medium solution;
$\frac{1}{5}$ of 1 per cent. for the stronger solution.

The medium solution is for ordinary use; the weaker solution is for use where very large areas have to be anæsthetized for extensive incisions; the stronger solution is for use in very sensitive inflamed parts.

After the solution has been injected, several minutes are required for surgical anæsthesia. The experiments of Schleich show that the salt water lessens the pain of infiltration, and that even the minute dose of morphine prolongs the anæsthesia.

Large quantities of the solution may be injected and extensive operations be performed under this method of anæsthesia.

Technique of Cocainization with Schleich's solution:

1. Careful sterilization of the site for operation.
2. Numbing the surface with ether spray.
3. Hypodermic injection with the sterilized solution until a wheal about five-eighths inch in diameter is raised.
4. Repeat injections at the margins of the wheal successively until

the extent of the anæsthesia equals the extent of the proposed incision. After the first puncture there is little or no pain; the anæsthesia lasts about ten minutes.

Central Anæsthesia by Cocaine. A 2 per cent. solution of cocaine sterilized by heating to 80° C. three times on consecutive days, if injected into the arachnoid space of the spinal cord by means of a sterilized hypodermic syringe, will produce surgical anæsthesia of all structures below the diaphragm. The dose of the solution varies, according to the weight of the patient, from 1.5 c.c. to 2 c.c. Under central anæsthesia by cocaine major operations, including hysterectomy, have been performed successfully. The method is said to be especially applicable to cases in which ether and chloroform are contra-indicated by cardiac, pulmonary, or kidney lesions.

Technique of Central Anæsthesia by Cocaine:

1. Imagine a line across the back from the crest of the ilium, on one side to the corresponding crest on the other side.
2. Carefully sterilize the cutaneous surfaces in the region of the centre of this line.
3. Place the sterilized forefinger of the left hand on the spine of the vertebra just above the line.
4. Insert the detached sterilized needle of a hypodermic syringe to the right and a little above the finger-tip (placed as above described) and push it into the spinal canal; the entrance of the needle into the canal will be indicated by the escape of a little spinal fluid.
5. The loaded barrel of the syringe is now screwed to the needle, the cocaine solution slowly injected into the canal, the needle withdrawn, and the puncture-point sealed tightly with a collodion-gauze dressing.

Surgical anæsthesia will follow the injection in about twelve minutes, and will last from one to three hours.

Central cocainization obviously demands the most scrupulous sepsis to avoid the disastrous results of infection in the arachnoid space. The utility and safety of this method have yet to be demonstrated.

Instruments.

Sims' speculum and Simon's speculum have already been described in the chapter on Diagnosis. For operations on the vaginal walls, such as the closure of vaginal fistulæ, repair of the lacerated cervix, division of the cervix, dilatation of the cervix, and curettage, Sims' speculum is regarded by all who have duly familiarized themselves with its use as incomparably superior to all others. See Chapter III.

Simon's speculum, though for plastic vaginal work inferior to Sims', is yet for some purposes a more practical instrument. It has one advantage over Sims'—*i. e.*, the patient being in the dorsal position, on a Kelly pad or rubber sheet, the operation may, with Simon's speculum, be done under constant vaginal irrigation.

Simon's instrument and the dorsal position are superior to Sims'

FIGURE 66.

Vulsellum forceps. Between the two teeth of each blade is a deep opening to accommodate the needle in the passage of a suture. The instrument has scissors-handles and is about ten inches long. A, reduced size. B, section of full size.

and the latero-prone position for all operations in which the pelvic cavity is to be opened through the vagina, such, for example, as vaginal hysterectomy, vaginal salpingectomy, and vaginal ovariotomy.

Vulsellum forceps similar in construction to those shown in Figure 66, are useful in various operations in the uterus and about the cervix.

FIGURE 67.

Flat vulsellum forceps used for steadying the cervix in operations and for many other purposes. *A*. Reduced size. *B*. Section of full size.

They serve to grasp and draw down the cervix, to grasp an intra-uterine tumor, and to steady the cervix during the passage of a suture or during curettage.

Scissors. The minor gynecological operations may be performed either with the scissors or with a knife. The choice depends much upon the education and habits of the operator. The scissors cause less hemorrhage, and when one becomes accustomed to their use he can work more accurately and more rapidly. Any strong, well-made, slightly curved scissors will suffice, but those of Emmet are especially adapted to intravaginal, perineal, and vulvar operations. Figure 68 shows a pair of blunt-pointed scissors, with straight blades bent laterally upon the shank at an angle of thirty degrees. They are useful

FIGURE 68.

Emmet's scissors for dividing the cervix. Reduced size.

for dividing the cervix, for making an artificial vesico-vaginal or urethro-vaginal fistula, and for dividing cicatricial bands in the vagina.

FIGURE 69.

Emmet's slightly curved scissors. Reduced size.

Emmet's slightly- and fully-curved scissors are almost indispensable for denuding in plastic operations; the slightly-curved, Figure

FIGURE 70.

Emmet's full-curved scissors. Reduced size.

69, are used for perineal and for ordinary intravaginal denudation; the strongly-curved, Figure 70, are convenient for denuding a strip high up across the vagina or cervix uteri in fistula and cervix operations. The scissors represented in Figures 69 and 70 are curved

toward the right, and are intended to be used with the right hand. Emmet mentions also two others, with curves to the left; but it is scarcely possible to imagine an operation in which the latter would be necessary.

Emmet's wire scissors, with blades pointed and slightly curved on the flat, are useful for removing sutures, and sometimes for cutting out cicatricial tissue. The slightly curved scissors, Figure 69, answer all the purposes for which straight scissors usually are employed.

Sponge-holders. Ordinary hæmostatic forceps with long handles serve the purpose of sponge-holders much better than instruments made expressly for the purpose.

Uterine Tenaculum. Numerous tissue-forceps have been devised for grasping the tissues to be denuded or excised, but a properly-constructed tenaculum in the educated hand is the most convenient and effective instrument for this purpose. With the tenaculum the operator can pick up and hold a smaller amount of tissue, and can therefore denude more superficially than is possible with the tissue-forceps. The instrument, Figure 71, has a perfectly straight hook a little more than a quarter of an inch long and at right angles to the shaft. It should be so strong and stiff that considerable force may be applied in the line of the instrument, without breaking or bending the hook; or in a lateral direction, without bending the shaft. The uterine tenaculum is useful not only in denudation, but also in almost every step of a gynecological examination or operation. In some operations as many as four of them may be required.

When to Operate.

Although it is a general rule not to operate during menstruation, it has by no means been proven that operations are more dangerous during this period. When menstruation is so long continued or so profuse as to endanger life or health, immediate operation may be imperative. The presence of menstrual fluid, however, is unfavorable, though not usually a bar to union by first intention in a cervix operation. An operation performed immediately upon the close of menstruation might cause it to reappear; if too near the anticipated period, it might excite a premature flow. One may safely operate between the third day after the close of one period and the tenth day before the anticipated appearance of the next.

The question of primary or secondary operations after puerperal lacerations has been much discussed. Emmet's operation for laceration of the cervix, unless there be hemorrhage from the torn surfaces, is ordinarily delayed until after the puerperium. Many successful cases of immediate operation, however, have been reported. For laceration of the perineum, however extensive, the immediate operation is desirable, for two reasons: The torn parts can be adjusted accurately to their former relations, which is almost impossible in the secondary operation; and the operation, if well performed, generally results in union, and thereby protects the patient against

septic infection through the torn surfaces. The writer, therefore, would advise the primary operation of perineorrhaphy even as late as two days after delivery. He has repeatedly operated on the second and third days, and once on the ninth, and, with scarcely an exception, the delayed operation has resulted in satisfactory union. If, however, the primary operation has been delayed for a number of days, it is best, before introducing the sutures, to denude with the curved scissors a narrow strip all around the torn surfaces, in order that fresh surfaces may be brought together. A delay of a few hours after labor insures greater freedom from capillary oozing from the torn surfaces, which sometimes occurs after closure of the wound, and which may prevent union. Moreover, if anæsthesia be required, it is better to wait for permanent retraction of the uterus; otherwise the anæsthetic may cause relaxation and consequent uterine hemorrhage.

FIGURE 71.

Uterine tenaculum.

It is the duty of the accoucheur at the close of the puerperium to examine the uterus, vagina, and perineum, and to repair any puerperal laceration or injury before evil results have developed from it. Operations may be necessary even during lactation. The child should be kept from the breast only until the mother has fully recovered from the anæsthetic.

Operations during Pregnancy should be restricted to cases of immediate and urgent necessity. Plastic operations, as a rule, may be deferred. Tumors connected with the reproductive organs, such as carcinoma of the cervix, ovarian cyst, uterine polypi, vaginal tumors, vulvar and rectal tumors, may have to be removed. The danger of abortion following operations during pregnancy is chiefly from possible sepsis—*i. e.*, from toxæmia; even the toxæmia from diffusible poisons and drugs, such as iodine, carbolic acid, bichloride of mercury, and quinine, may induce abortion; hence the use of such drugs should be limited and judicious.

Multiple Operations. When several operations are necessary, it may be proper to perform them at one sitting. A rapid operator may perform safely dilatation of the uterine canal, curettage, trachelorrhaphy, elytrorrhaphy, perineorrhaphy, and the removal of hemorrhoids at one time. This amount of operating at one sitting would hardly be permissible for a slow operator or a beginner. The time of an operation should usually be less than an hour and a half or two hours. Abdominal section or vaginal section is sometimes combined with plastic vaginal work. This combination, although at times permissible, is not generally approved.

Plastic Operations.

This subject comprehends all operations for the repair of lacerations of the cervix and perineum, and of vaginal fistulæ; it also includes certain operations on the vaginal walls known as elytrorrhaphy, and numerous operations on the urethra, vulva, and anus.

A clear appreciation of the causes of failure will contribute to success in plastic surgery. Two principal causes of failure are: first, parts which never ought to be united are often brought together; second, faulty technique may result in failure of union.

One of the most common bad results of the repair of the lacerated cervix uteri or perineum is the union of parts which were not together before the injury, and cannot be united without harm. A plastic operation which results in union is commonly called successful. If, however, there has been union of wrong parts, actual harm may have been done. The flap-splitting operation of perineorrhaphy too often gives this result.

Union by First Intention will almost always result from a correct operation. True, in certain cases of vaginal fistula in which there has been great loss of tissue from sloughing, failures may arise from the cicatricial character of the parts or from difficulty in holding the edges together. In very fat subjects perineorrhaphy, especially when the rupture extends through the sphincter ani muscle, may fail even after the most skilful operation. Certain systemic diseases, among them diabetes, are unfavorable for union. Generally the conditions of success are within the control of the operator. These conditions are simple, but absolute; and the operator who has neglected them can neither fairly attribute his failure to the debilitated state of the patient, nor to chance, nor to accident. Indeed, union must almost invariably follow if the surfaces to be united are properly prepared and kept in contact for a week. The first condition, asepsis, has been discussed. The others will be presented in the following paragraphs.

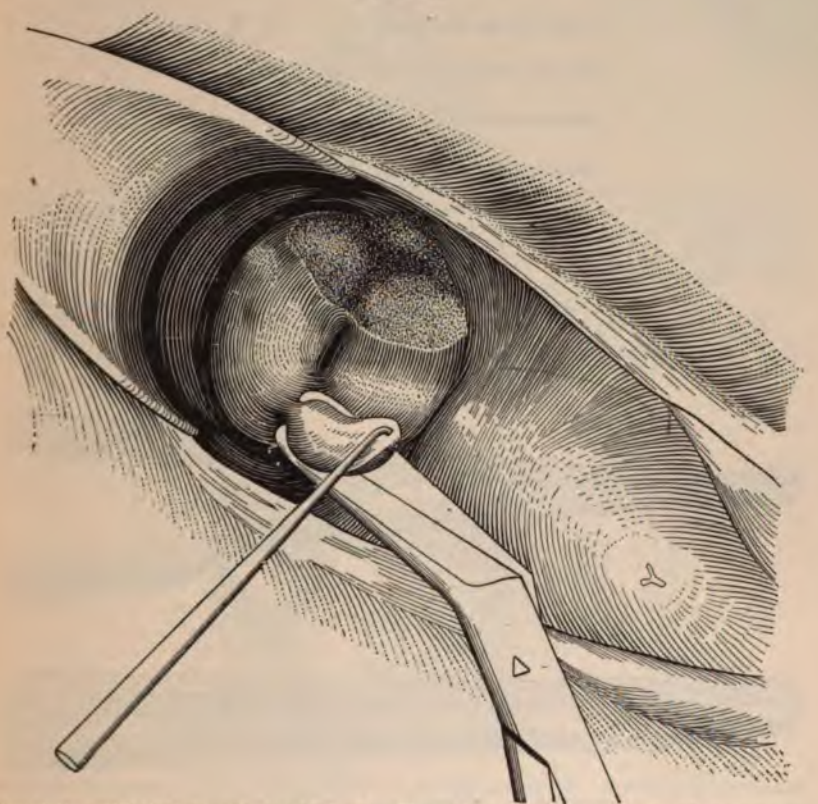
Denudation. The patient having been etherized, placed in position, and the field of operation exposed, the surfaces to be united should be denuded. Correct denudation is a prerequisite to healing by first intention. Surfaces to be united should be so denuded that when brought together they will fit accurately, otherwise a part of the denuded surface, being in contact with an undenuded surface, must heal by granulation and suppuration, which may excessively retard the rest of the wound, and always produces cicatricial tissue, which is very objectionable. The denuded surface should moreover be smooth and free from shreds, which might die and become sources of septic infection. Every particle of membrane or skin within the line of denudation should be scrupulously removed. If the surface be not healthy, the more superficial the denudation the better; unhealthy and cicatricial tissues do not readily unite, and should be removed, when practicable, be removed.

[illegible] shows the action of the tenaculum and scissors in [illegible] the superiority of the tenaculum as a substitute for the

tissue-forceps must become apparent to any one who will familiarize himself with its use.

Needles. A round needle is preferable to one with a cutting edge. The incised wound made by the latter is generally too large for the

FIGURE 72.



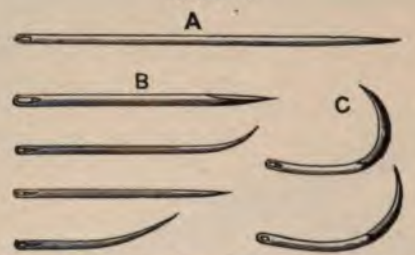
Denudation with the tenaculum and scissors. Figure 69 is a better illustration of the scissors here used.

suture, bleeds freely, is prone to suppurate, and requires more time for healing. The punctured wound made by the former readily shrinks down upon the suture, is less liable to bleed or to suppurate, and, after the removal of the suture, heals more quickly. The tissue, especially in the cervix uteri, is, however, often so dense as to necessitate the use of a needle with a cutting edge.

Many of the most dexterous operators prefer the straight needle to the curved. The straight needle has two advantages: first, however deeply it may be buried in the tissues, the position of its point can always be determined from its direction and length; second, the force employed in its introduction being in the direction of the needle, it may without any danger of breaking be of much smaller

calibre than the curved needle, which must be introduced by a force exerted in the line of a tangent to the curve.

FIGURE 73.



A. Straight needle for external sutures in perineorrhaphy. B. Straight and curved needles for operations on the vaginal walls and cervix, and for vesico-vaginal fistula; the upper needle under B is trocar-pointed for very dense tissues. C. Simon's strongly-curved needles for vesico-vaginal fistula. The needle marked A would be better for general use, if made somewhat shorter and slightly curved at the point. The second needle under B is best suited for cervix and perineum operations.

The straight needle, in a word, requires less force for its introduction, is less liable to break, and makes a smaller wound. Moreover,

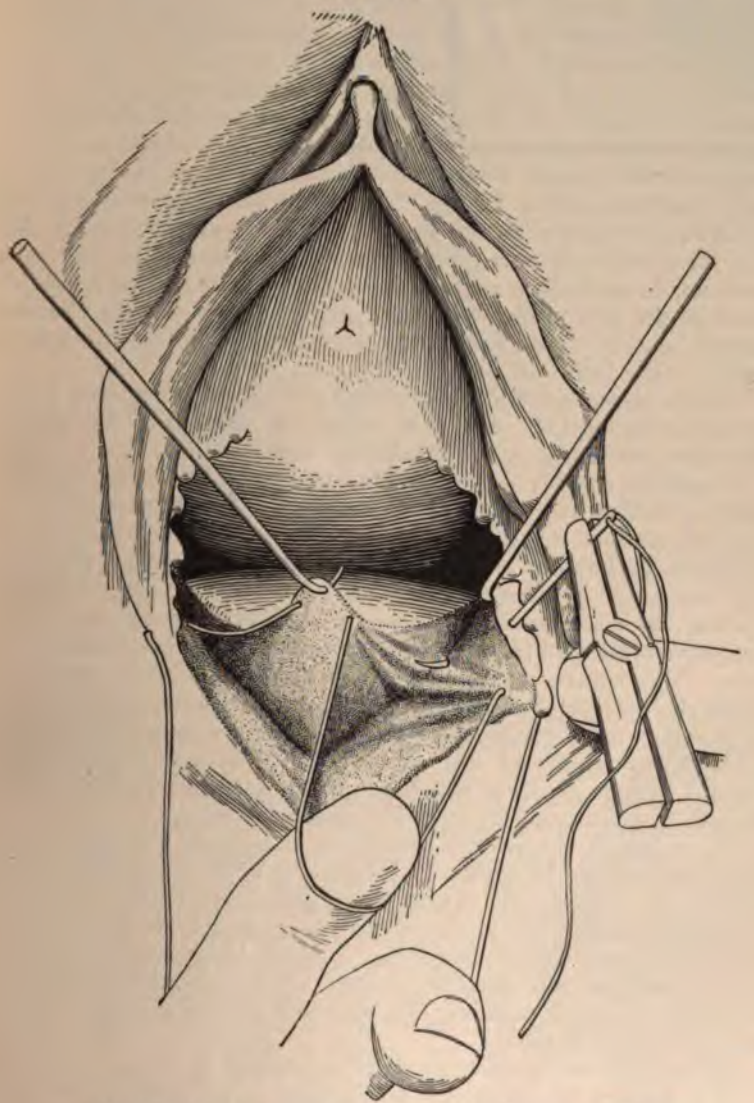
FIGURE 74.

Emmet's needle-forceps. The spring between the handles causes them to open when the grasp is relaxed. A. Reduced size. B. Section of full size.

the simple rotation of the needle-forceps on its long axis by a turn of the wrist enables the operator to sweep the straight needle around a curve in the vertical plane, or it may be carried around a curve in the horizontal plane by loosening and tightening the forceps grasp upon the needle at very short intervals, so that the angle between the forceps and the needle may change almost constantly during its passage. In this way the straight needle may be made to carry a suture around a curve more accurately than the curved needle, and often more easily. Obviously, the lock forceps, which do not permit of this freedom of motion, are unsuited to such manipulations. Figure 74 represents Emmet's needle-forceps without lock. The eye of the needle, if included in the grasp of the forceps, may be crushed; to avoid this, grasp it on the proximal side of the eye. The plain, round point, however sharp, sometimes encounters great resistance in

passing through dense tissue. The trocar point represented in Figure 73, or the saddler's point, is less objectionable than the cutting edge, and may be introduced almost as easily.

FIGURE 75.



The introduction of a threaded needle to close a lacerated perineum.

Various needles with handles attached or detached, and of different curves and shapes, have been devised, some with eyes at their points, some without eyes, and others of cylindrical form, through

which the suture is passed lengthwise from one end to the other. They complicate rather than simplify an operation, and are in no respect superior to the simple needle and thread.

The Application of Sutures. The most practical materials for sutures are silkworm-gut and catgut. The peculiar advantages of each will be presented in the description of the special operations. Before the introduction of the sutures, approximate the denuded surfaces with tenacula to determine whether they are of such size and shape that the union will produce the desired result, and whether accurate coaptation of the margins can be secured without undue traction, which might cause the suture to cut out. Then hook up the margin of the wound with a tenaculum, introduce the needle, and apply counter-pressure, Figure 75, until the needle-point can be seized and drawn through with the forceps. Some operators use the blunt hook for counter-pressure; but a strong tenaculum which will neither break nor bend is often preferable, because it may also be fixed in the tissues at the very point where the operator desires to force the needle through, and it thereby insures greater precision in directing the needle to the point of exit.

Uterine tissue is often so dense that great force is required to drive the needle through it. For this reason the passing of the needle is often the most trying part of trachelorrhaphy.

In making counter-pressure the tenaculum may slip and the uterus receive a violent and sudden jerk, which is not without danger, especially when often repeated. This may be avoided and the operation facilitated by holding the flap in the vulsellum forceps, Figure 66, while the needle is being forced through between its teeth. These forceps may be made by filing the teeth of Hank's forceps shorter and finer, and by filing a deeper opening between the two teeth of each blade. The sutures should be about one-fourth of an inch apart, should include considerable tissue, and, if practicable, should pass entirely under, not through, the denuded surface, so as not to be in contact with any portion of the wound. When at a distance from the denuded surface they are less liable to irritate and produce swelling and inflammation, and are therefore less liable to cut.

The tying of the sutures should be done with the greatest care. The thread should be drawn just tightly enough to hold the denuded surfaces in contact. If drawn too tightly, the tissue will become strangulated and swollen, the sutures will cut out, the tissue will inflame, and the operation may fail. It is also important that the surfaces be brought into accurate contact, so that denuded surface may be against denuded surface. In no place should mucosa or skin be against denuded surface.

Before tying the sutures the bleeding should be stopped; otherwise small quantities of blood may accumulate in the track of the wound and serve as a mechanical bar to union or set up wound disease. The advantages of a constant stream of hot, sterilized water playing on the wound during the tying of the sutures are self-evident.

The after-treatment will be presented under the special subjects. The field of operation is to be kept clean and immobile.

Removal of Sutures. Ordinarily the sutures should be removed at the end of a period varying from ten to fifteen days; if suppura-

FIGURE 76.

Removing a suture. An ordinary hæmostatic forceps may be used in place of the forceps here shown.

tion occur, earlier. Sutures about the vulva and perineum should be removed in about ten days. If left much longer, they may become loose or cause suppuration. In the vaginal walls they may be left several days longer. In the cervix, where suppuration seldom occurs, they should be removed in about two weeks, unless perineorrhaphy has been done at the same time, in which case their removal cannot safely be undertaken in less than three or four weeks. To remove a suture seize the free end with a forceps, and with the scissors cut the nearest side of the loop. See Figure 76. Cutting the nearest side tends to hold the freshly united wound together during the withdrawal of the suture; if the loop were cut on the farther side, its removal would tend to reopen the wound. It is well to seize with the forceps only one of the free ends, for the other would then be available in case this one were accidentally cut off. Always make sufficient traction to bring the loop in sight before cutting, otherwise both sides may be cut off below the knot and the loop left. If then the ends of the loop retract, as they usually do, its removal is extremely difficult; it may remain indefinitely and keep up a constant suppuration. Its final removal may necessitate anæsthesia and an incision.

Assistants. Four assistants usually are required for a gynecological operation—one to give the ether, one to wash sponges, one at the operator's left, to hold the speculum, and one at the operator's right, to sponge and render other assistance. If the operation be on the perineum or vulva, and the patient be in the dorsal decubitus, the thighs must be flexed and held in the lithotomy position by the two assistants on the right and left. The assistants in charge of the ether and sponging should be physicians. The washing of sponges, holding of the speculum, and threading of needles are better done by nurses.

Dilatation of the Uterus.

Save in exceptional cases, it is impossible by any speculum yet devised to inspect the interior of the uterus. The cavity of the uterus may, however, by dilatation be made surgically accessible to the examining finger or to instrumentation. The indications for dilatation may be diagnostic or therapeutic, or both. Among these indications are stenosis or stricture of the canal, uterine hemorrhage due to endometritis, neoplasms, abortions, and pathological anteflexions. The means and methods are these:

1. Incision.
2. Tents.
3. Graduated sounds.
4. Instruments of diverging blades.

1. Incision of any portion of the uterine canal may be required in order to render the endometrium accessible for instrumental or manual interference. But incision is especially applicable to the lower part of the cervical canal and to the external os, and is performed for congenital or acquired stenosis. Its object is to insure the free outflow not only of menstrual fluid, but also of the uterine mucus, which, if retained, becomes offensive, irritates the uterine mucosa, and causes hypersecretion. Oftentimes the uterine secretions are so impeded in their passage through the strictured os internum or externum that they accumulate, distend the uterine cavity, and are thrown off at irregular intervals with expulsive pains simulating labor-pains. This explains certain cases in which there is a recurrence in the intermenstrual period of all the painful phenomena of obstructive dysmenorrhœa.

Schroeder's Method. Schroeder, in certain cases, especially of intra-uterine polypi, incises the cervix bilaterally, seizes the posterior lip with a vulsellum forceps, and, with his finger as a dilator, works his way to the uterine cavity. The uterus, dilated in this way and well drawn down, is very accessible. Since the lateral incisions extend into a neighborhood that is very liable to infection, the safety of the operation must depend upon thorough asepsis. In a rigid uterus, moreover, it is often impracticable to incise and dilate according to the method of Schroeder.

The Author's Method of rendering the entire uterine cavity and the uterine walls accessible for surgical operations, such as the removal of myomata through the vagina by free median incision of

the anterior uterine wall will be described under the Surgical Treatment of Myomata, Chapter XVII.

2. Tents. Sponge, tupelo, and sea-tangle are the materials of which they commonly are made; if they are introduced into the uterus in the dry, compressed state, the mucous secretion, stimulated by their presence, causes them to swell laterally to a diameter two or three times greater, and, correspondingly, to dilate the canal.

The danger of continuous dilatation by introducing one tent after another is very great. Alarming results often have followed the use of the second or the third tent, seldom the first. A tent should not under any circumstances be allowed to remain in the uterus more than twelve hours. The tents furnished by instrument-makers are usually not aseptic. Before using them, therefore, it is always well to subject them to the dry-heat process of Boeckmann, as described in Chapter II. for the disinfection of catgut. After the removal of a tent the endometrium should be washed out with sterile water, and disinfected with a topical application of a strong solution of iodine in 95 per cent. carbolic acid; this application should be made by means of an applicator wound with cotton. The danger of infection from the use of tents is so great that the use of them is not generally approved.

3. Graduated Sounds. The uterus, like the urethra, may be dilated by means of graduated sounds. Figure 77 shows Peaslee's

FIGURE 77.

Peaslee's uterine dilators. Reduced size.

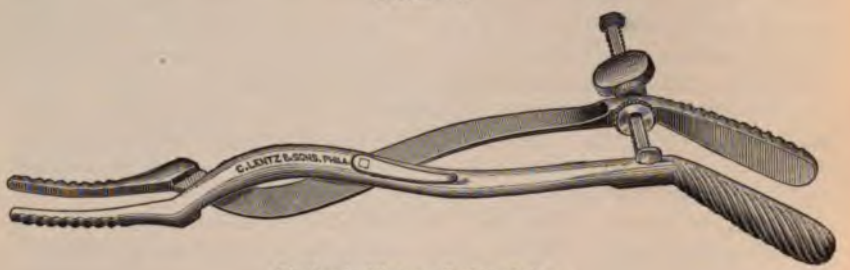
uterine dilators. Hegar and Hanks also have devised similar instruments which are equally serviceable. They are adapted particularly to cases in which the abdominal walls are thin and lax, so that the uterus may easily be fixed by the hand over the abdomen, while one sound after another is forced into the canal until the required dilatation is accomplished. If the abdominal walls are thick and tense, it is necessary to use Sims' or Simon's speculum, and during dilatation to fix the cervix with the vulsellum forceps. In such cases the diverging instruments are preferable.

4. Diverging Instruments. Innumerable instruments have been devised with blades which diverge and dilate the uterus when the handles are pressed or screwed together. See Figures 78, 79, and 80.

Wathen's dilator and Goodell's modification of Ellinger's dilator have serrated blades, to prevent them from slipping out during the

process of dilatation; this accident is much more liable to occur with the latter instrument, on account of the parallel action of the blades;

FIGURE 78.



Wathen's dilator. Reduced size.

FIGURE 79.

The Goodell-Ellinger dilator. Reduced size.

and notwithstanding strong counter-traction with the vulsellum forceps it does occur in many cases long before dilatation is completed. The blades of the Wathen dilator diverge in a fan-like manner, and, since for this reason they do not slip out, are to be preferred. These dilators are generally too heavy to be inserted until the way has been opened by a lighter instrument, like Palmer's, or by the smaller graduated sounds, or by a tent. It is important that all instruments for powerful dilatation be supplied with the thumb-screw for screwing the handles apart. If the handles are compressed with the hand, rupture of the uterus is apt to occur. The smaller dilator of Palmer does not require the screw.

Dr. Goodell,[1] of Philadelphia, was foremost among the advocates of this method of dilatation. In a large experience with extreme dilatation under ether he had no fatal result and no serious inflammatory disturbance. He carried the dilatation to three-fourths of an inch in the thin-walled, unyielding infantile uterus, and to one and one-quarter inches in ordinary cases. In case of a rigid, unyielding, or thin-walled uterus, which might tear from rapid expansion of the dilating blades, it is permissible to commence the dilatation with a sponge- or tupelo-tent, the softening influence of which renders the canal more easily and thoroughly dilatable by the forcible method.

The dangers of dilatation are from traumatism and sepsis. There may be extensive rupture from over-distention by rapid dilatation of

[1] American Journal of Obstetrics, 1884, p. 1179.

a rigid uterus. Dangerous hemorrhage, peritonitis, and death may result. A uterus ruptured by dilatation should be packed and drained

FIGURE 80.

Modification of Palmer's uterine dilator. A. Reduced size. B. Section of full size.

by aseptic gauze. An abdominal or vaginal section may be necessary to control hemorrhage. The special dangers of dilatation by tents, and the impossibility of enforcing thorough antisepsis in their use have been considered in a previous paragraph. It would, however, be a fatal mistake to suppose that antisepsis deprives dilatation by any method of all its perils. All manipulations of this class, says Fritsch, are dangerous, and not to be employed unless the indication is quite clear. Existing pelvic inflammation, acute or chronic, is a serious contraindication. Indeed, the history of a majority of fatal cases includes previous cellulitis, peritonitis, or metritis. Dilatation, however slight, by any method, should be regarded as a surgical operation, should always be done at the patient's house or a hospital, never at the office, and should be followed by rest in bed for a time varying from one to seven days. Forcible dilatation, either by sounds or by diverging instruments, except when the dilatation is to be slight, requires an anæsthetic. If there be tenderness or other signs of inflammation about the uterus, or if the patient has suffered from a previous infection, ice should be kept over the hypogastrium until the danger has passed. See Treatment of Pelvic Inflammation.

Special Advantages of Each Method of Dilatation:

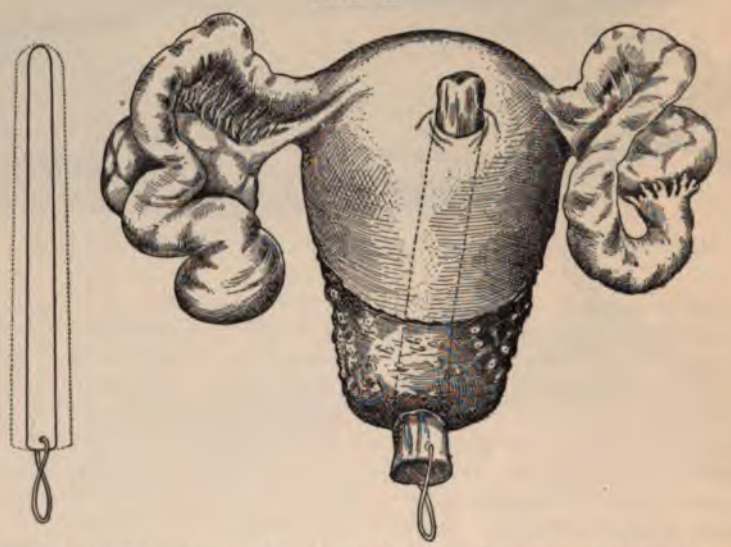
Incision. Contraction of the os externum and lower portion of the uterine canal is treated best, according to the nature of the case, either by Fritsch's operation for enlarging the os externum by incision, or by Schroeder's operation of bilateral incision of the cervix. See Treatment of Cervical Endometritis.

Tents. Sponge-tents are the most dangerous, tupelo the least. Laminaria has but one advantage over tupelo—flexibility and adaptability to a tortuous canal. In a case of rigid hyperplastic or thin-walled cervix not safely dilatable by rapid means, the tent is sometimes permissible as a means of preparation for rapid dilatation by graduated sounds or diverging instruments. The use of it, however, even in careful hands, has many times caused fatal pelvic infection.

Graduated sounds and diverging dilators are generally the safest and most effective means of dilatation, and should have the preference unless the softening effect of the tent is especially desired.

One may combine the principle of graduated sounds in the use of diverging dilators. This requires a series of dilators of graduated

FIGURE 81.



Uterus perforated by a tupelo-tent. Figure to left shows size of tent before and after expansion.

sizes. The small instrument is first inserted, and the blades spread; the dilator next larger is then used in the same manner; and so on through the series. Before spreading the blades each instrument acts as a graduated sound; as the blades diverge they act on the principle of the glove-stretcher. At least four dilators are required: two of the Palmer or Nott pattern, and two of the Wathen variety.

A small light dilator as a means of complete dilatation has two disadvantages: first, the light blades may bend and fail to stretch the canal beyond a limited degree; second, if they do not spring or bend, they are apt to imbed themselves—that is, crush their way into the uterine walls. The result is not dilatation by stretching, but by tearing. The wound thus inflicted may be dangerous. This unfortunate result may be avoided by the use of a graduated series of instruments.

The technique of dilatation is simple: 1. Disinfect the vagina and vulva. 2. Expose the cervix by a Sims' or Simon's speculum. 3. Grasp the cervix firmly in the teeth of a vulsellum forceps. Figure 66. 4. Introduce the successive dilators and slowly screw the blades apart. 5. Wash out the uterine cavity with sterilized water from a fountain-syringe through a rubber tube and canula. The ordinary glass female catheter is a good canula. The dilatation should be sufficient to give a free return-flow through a single canula: if the dila-

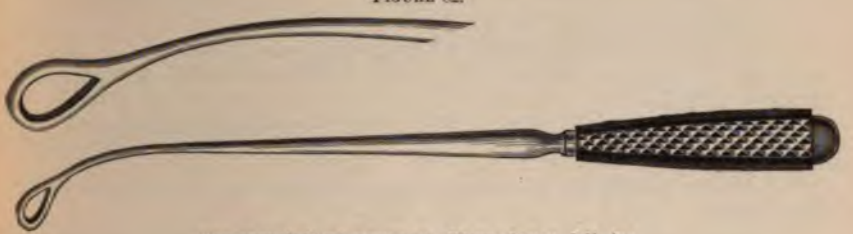
tation is not sufficient, irrigation is usually contraindicated; hence the double-current canula is seldom required.

Salpingitis, sactosalpinx, and other forms of circumuterine inflammation may contraindicate dilatation.

Curettage.

The diagnostic significance of the curette has been given in Chapter III. The therapeutic purpose is the removal of diseased tissue or foreign bodies from the interior of the uterus. The symptomatic indications are usually hemorrhage, uterine discharges, or infection due to some intra-uterine cause. The instrument was used first in 1843 by Récamier; it has passed through numerous modifications, and on account of the disastrous results that have followed the use of it—perforation of the uterus, metritis, salpingitis, cellulitis, peritonitis—it has received at times the severest censure, not wholly undeserved.

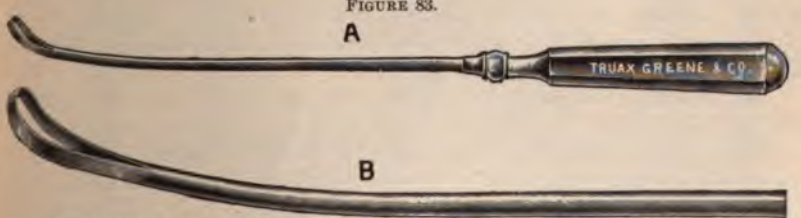
FIGURE 82.



Thomas's dull wire curette. Upper figure, full size.

The dull curette, shown in Figure 82, is made of flexible copper wire. The loop has slightly flattened but not cutting edges; the malleable shank may be bent like a probe to conform to the direction of the uterine canal. Whatever the force applied, it is not likely to injure the sound tissue, although it will remove loose foreign bodies, such as the secundines of an abortion.

FIGURE 83.



Sims' sharp, fenestrated steel curette. A. Reduced size. B. Section of full size.

The sharp curette, shown in Figure 83, is designed to remove such diseased tissues as are connected more intimately with the uterus; for example, an infected endometrium or malignant growths. The loop is of steel, and has a sharp cutting-edge. The shank is of flexible copper, and may be bent to conform to the direction of the uterine canal.

The following is a summary of the indications for the use of the curette:

I. For diagnosis of—
   a. New growths of the uterus—fibroids, carcinoma, sarcoma, deciduoma malignum.
   b. Inflammatory products—endometritis.
   c. Retained products of conception—placenta, fœtus, hydatid mole, fleshy mole.

II. For therapeutic purposes in cases of—
   a. Endometritis.
   b. Mucous polypi.
   c. Inoperable malignant growths.
   d. Hemorrhage in inoperable fibroids.
   e. Foreign bodies, such as secundines of abortion.

The dangers of the curette are in causing:
   1. Septic infection.
   2. Perforation of the uterus.
   3. Hemorrhage in cases of malignancy and pregnancy.
   4. Permanent destruction of the endometrium by scraping too much.

Technique of Curettage. The steps of curettage are these. See Figure 34.

1. Dilate through a speculum sufficiently for the easy admission of the curette.

2. Steady the cervix with the vulsellum forceps and introduce the curette.

3. Should the object be to remove some foreign body, the dull curette will readily accomplish this if used like a rake. Little force is required. The sensation imparted to the fingers will show whether all the foreign substance has been removed—*i. e.*, whether the loop glides over a smooth surface.

4. If the object is to remove diseased tissue, the sharp curette should be used with a back-and-forth scraping motion round and round the endometrium. The operator will know when the tissue has been sufficiently removed: first, by the fact that no more comes away; second, by the sensation which the curette imparts to the fingers, of a hard, resisting, more or less healthy, intra-uterine surface.

5. The diseased tissue having been scraped away, the endometrium should be washed out with sterilized water, as described on page 103.

6. If it is desirable to apply a medicinal substance, such, for example, as a saturated solution of iodine crystals in pure carbolic acid, this may be done by means of an applicator or a fine dressing-forceps wound with absorbent cotton. Before making the application, pack absorbent cotton under the cervix, to absorb any fluid which otherwise might run out and irritate the vagina.

7. The after-treatment is rest in bed for a week, with vaginal douches twice daily of one-half of 1 per cent. solution of lysol in sterilized water.

CHAPTER VI.

MAJOR OPERATIONS.

THIS chapter is a general consideration of those procedures which are common to the opening of the peritoneal cavity. Peritoneal section may be made through the abdominal walls or through the vagina; hence the subject is divided into

1. Abdominal section.
2. Vaginal section.

1. Abdominal Section.

Operating-tables. The table already described for examination and for vaginal operations will suffice for abdominal section, if lengthened so that the patient may lie upon it at full length. For this pur-

FIGURE 84.

Modified Trendelenburg table.

pose a short table may be supplemented by a stand or by another shorter table.

The Trendelenburg Position. A favorite table for hospital use, and especially for abdominal section, is that of Trendelenburg or some

modification thereof. The top of the table may, at any time during an operation, be adjusted readily to any desired angle, and by this means the hips may be so elevated as to cause the intestines to gravitate away from the pelvis toward the diaphragm. The surgeon may then gain, in favorable cases, an almost unobstructed view of the pelvic basin and may work deep in the pelvic cavity unimpeded by the distended intestines. It is even maintained by advocates of this position that in these favorable cases the operation may be proceeded with as readily as if it were on the external surface. Extravagant claims are made that this position makes pelvic surgery easy, so that an indifferent operator may safely undertake it. The table is useful during anæsthesia, when the pulse and respiration fail and it becomes desirable to elevate the lower extremities and lower the head. The forward flexure of the head upon the body as here shown may impede respiration, and is therefore objectionable. This fact would suggest the use of a uniformly inclined plane upon which the head as well as the body may rest.

The advantages of this position, although admitted, should not be over-estimated. Besides the fact that in many cases the field of operation is not rendered more accessible, the position has several disadvantages: first, infectious fluids which escape during the operation are certain to gravitate toward the diaphragm, and may infect the general peritoneum; second, the abdominal muscles are often made more rigid. The Trendelenburg position does not overcome, but rather lessens, a few—only a few—of the difficulties and dangers of abdominal surgery. With the patient on an ordinary table, large gauze pads may be used in such a way as to keep the intestines out of the way, and thereby to expose the deeper parts of the pelvis.

Substitute for the Trendelenburg Table. The end of a common table may be raised on a block or chair so as to give it the required slant. The patient then, with the legs hanging over the foot of the table, may readily be adjusted to the desired angle without recourse to the more or less complicated Trendelenburg table.

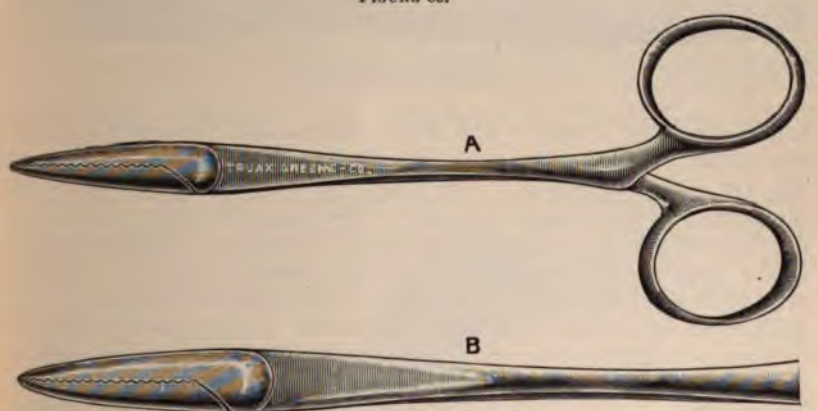
The Preparatory Treatment. The necessary antiseptic procedures to an aseptic result have been set forth in Chapter II. After the patient is on the table and under anæsthesia it is well to scrub the abdomen again with the sterilized soap and water, then wash with clean water, then with alcohol, and finally with a 1:1000 solution of bichloride of mercury. This is especially important in cases of acute pelvic suppuration, in which thorough scrubbing before anæsthesia is not tolerated. The patient's clothing should be of light flannel—undervest, drawers, woollen stockings, and night-gown.

It is furthermore important, before beginning a grave operation, that the various organs of elimination be sufficiently active, so that the danger of autointoxication from the retention of waste-products may be reduced to the minimum. The demand made upon the patient by the operation itself reduces the eliminating capacity of these organs, sometimes to the point of danger; hence the imperative necessity of lightening their burden. Careful examination of the kidneys

and heart may lead to essential preparatory treatment of these organs.

The Incision. To open the abdomen only a few instruments are required; in fact, it may be laid down as a general proposition that the most skilful surgeons operate with the fewest instruments. A scalpel, a few strong hæmostatic forceps, long and short, and a pair of strong straight-bladed scissors are quite sufficient. Twelve short and six long hæmostatic forceps will suffice for any operation. Sir Spencer Wells and others have reported cases in which, after the operation, hæmostatic forceps were found post mortem in the peritoneal cavity. In order to avoid this, one should always operate with the same number of forceps, or at least carefully count and record the number before the operation is begun, and before closure of the wound. Unless the operator is certain of his assistant, he will do well to count them himself. The incision for gynecological exploration or operation is usually in the median line near the pubes.

FIGURE 85.



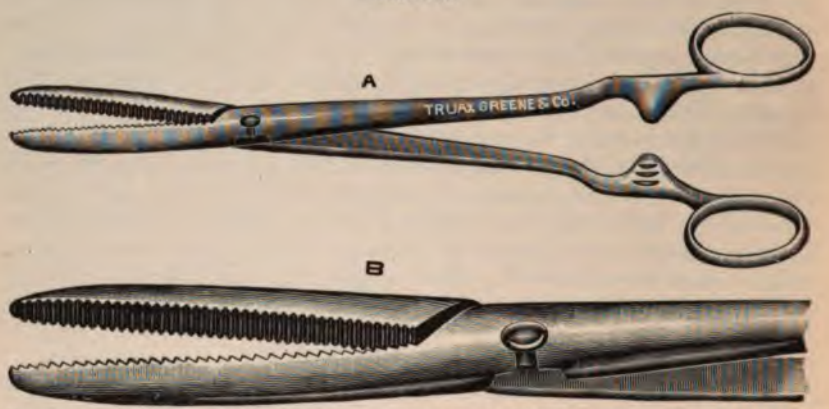
Short hæmostatic forceps. A. Reduced size. B. Section of full size.

Exploration. Every abdominal section should commence as an exploratory incision, and should therefore at first be only long enough to admit the index finger for examination. If it is necessary to introduce the hand, the incision may be extended in either direction. The operator now decides whether he will close the wound after the simple diagnostic exploration, or proceed to a complete operation. Mr. Tait, in urging the exploratory incision as the first step of an abdominal operation, once wisely said: "It is always easy to turn an exploratory incision into an operation, but often quite impossible to turn an incomplete operation into an exploratory incision."

The median incision through the linea alba does not expose or wound the recti muscles. If, however, the linea alba has been displaced by a tumor or by other causes and is not readily found, one may properly ignore it, cut directly through the upper fascial sheath of the muscle, separate its fibres longitudinally, and then divide the structures beneath until the cavity is reached. Many operators have

adopted this method in preference to the usual incision through the linea alba. The purpose is to secure union of the muscular structures themselves, and thereby get a thicker, stronger cicatrix. When cut-

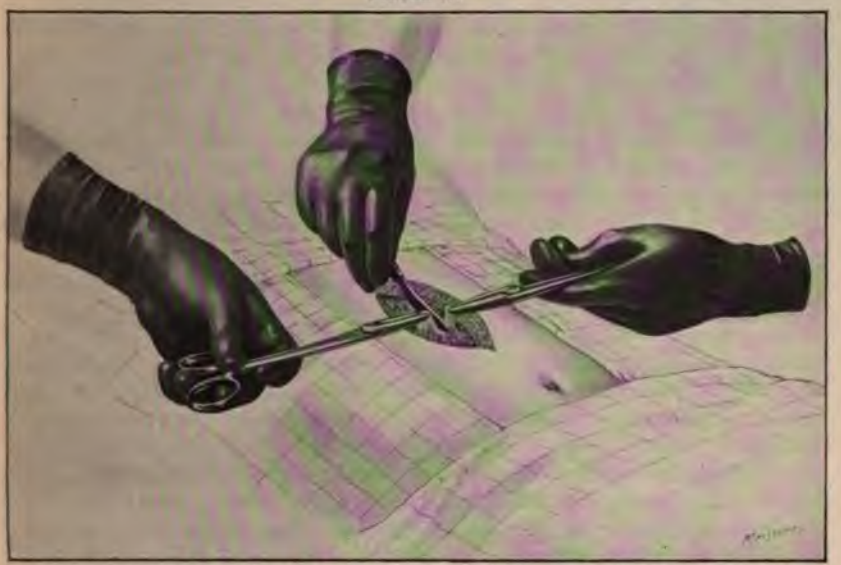
FIGURE 86.



Long hæmostatic forceps. A. Reduced size. B. Section of full size. These forceps are most useful as sponge-holders.

ting down upon a tumor, one often reaches the linea alba with the first stroke of the scalpel, and the subperitoneal fat with the second. The fat is then separated by the finger and handle of the scalpel, and the peritoneal membrane exposed. Bleeding-points are now secured by pressure-forceps; ligatures are seldom required. The peritoneum is then superficially caught by two small pressure-forceps. The operator's left hand retains one, and that of the assistant the other. The peritoneum is usually so translucent that the viscera just beneath can be seen as it glides over them; it is now lifted from the viscera by the pressure-forceps, and by a single stroke of the scalpel divided between them. The grooved director formerly in use is rather a hindrance than a help. In grasping the peritoneum in the two forceps for incision, one should be careful not to include a bit of intestinal wall. The writer once in this way opened the intestine. Immediate suture, however, resulted in prompt union, and no permanent harm was done. Sometimes the intestine is adherent to the parietal peritoneum. The incision must then be made slowly and with great care. One may sometimes avoid cutting through the bladder-wall by recognizing in time its greater vascularity. If the intestines or bladder are adherent and unrecognizable, this fact will be apparent by the failure of the operator to see the viscera through the translucent peritoneum, or by the fact that the peritoneum does not, as in an ordinary case, glide over them. It is then better to prolong the incision upward or downward and enter the abdomen above or below. The adherent viscera may then be detached, and the incision completed to its original point. Deliberation, care, and judgment will usually enable the beginner to find his way safely to the abdominal cavity.

FIGURE 87.



Abdominal incision, cutting through peritoneum. Peritoneum held up away from abdominal viscera by pressure-forceps. Forceps on left held by left hand of assistant; forceps on right held by left hand of operator.

FIGURE 88.

Enlarging abdominal incision. Forceps shown in previous figure are lying one on either side of wound with everted margins of peritoneum in their grasp.

The cavity being open, the incision may be lengthened as desired by the scissors on the inserted index-finger as a guide. The length of the incision will vary with the requirements of the case and the dexterity of the operator; the shorter the incision the less the danger. Sufficient room, however, should be given for effective work. The added risk of a longer incision by comparison with the added safety of an unimpeded operation is insignificant. The pressure-forceps may now be removed from the bleeding-points; if at any point the bleeding continues, it may be controlled by torsion or by fine catgut ligature.

Before invading the abdominal cavity for purposes of examination or operation, one should seize the margins of the peritoneum by two or three forceps on either side, and draw it out through the wound toward its cutaneous edges so as to make it cover the cut surfaces. The wound is thereby protected and the peritoneum is not stripped off from its adjacent tissues as it might otherwise be during the subsequent manipulations.

Adhesions. The conditions which give rise to adhesions usually also cause more or less thickening of the peritoneum. Sometimes the parietal peritoneum is so thick as to be unrecognizable. The operator may be uncertain whether he has cut through the peritoneum, and this uncertainty may be increased by the presence of adherent intestines. Large areas of peritoneum have been detached from the adjacent abdominal wall under the wrong impression that the peritoneum had been divided, and that intraperitoneal adhesions were being separated. Experience and sense are the only guides. There are no safe rules. Adhesions usually are separated by means of the finger, the hand, or the sponge. If great care is not used in separating intestinal adhesions, one or more coats of the bowel wall may be stripped off with the adherent tissues; this might result in sloughing and a consequent fecal fistula. Such traumatism should be repaired promptly by drawing together the peritoneal margins with fine catgut or silk sutures. The sponge, as used by the late Thomas Keith, is a most useful means of separating the adhesions between intestines or omentum and a tumor. By firm and gentle sponge pressure against the adherent bowel at the point of attachment, one literally may sponge it away from the tumor. It is surprising to note the facility with which rather firm adhesions may thus be broken. In breaking the adhesions in this way the surgeon avoids stripping off one or more coats of the bowel. On the contrary, the peritoneal covering of the tumor is apt to remain on the bowel. The sponge method is more gentle, more effective, and less productive of shock than the usual method of tearing with the finger. Adhesions too strong for the sponge or finger have to be cut.

Intra-peritoneal Hæmostasis. Hemorrhage during an operation is treated on general surgical principles by forcipressure, ligature, sponge-pressure, or styptics.

As the operation proceeds, forcipressure forceps placed on small bleeding points, and left there a few minutes, will usually suffice. If the hemorrhage continues, each point may be secured by torsion or by a

fine catgut ligature; or several points, by a basting process, may be included in a ligature. Troublesome oozing, deep in the pelvic wall, often subsides on long-continued sponge-pressure. The sponge should be wrung out in very hot water, and very firmly packed against the bleeding surface, and left there for several minutes. Iron, tannin, and alum, since they are apt to leave masses of coagulated blood which may decompose in the pelvis, are objectionable. A sterilized 10 per cent. solution of antipyrin is a safe and often efficient styptic; it may be applied with the sponge.

Catgut versus Silk for Ligatures.

Hæmostasis is secured best by catgut—see Sterilization of Catgut, Chapter II. Catgut is preferable to silk because in case of localized infection around the ligature the non-absorbable silk remains as a foreign body and is apt to perpetuate a suppurative process. This process, if the patient survives, may form a sinus leading from the ligature to the external surface, usually through some point in the abdominal wound. Such a sinus may continue to suppurate for weeks, months, or years, until the ligature is cast out or manually removed. Catgut sutures and ligatures disappear by absorption in a few days or weeks, and give no further trouble; if of good quality and properly disinfected, they are perfectly reliable and safe.

Closure of the Wound. The ordinary method by through-and-through interrupted sutures, including the entire thickness of the abdominal wall, and tying upon the skin, should be abandoned, and the method of buried chromic catgut suture should be substituted.

The Buried Catgut Suture Throughout.[1] Fine catgut sufficiently chromicized to resist absorption for six weeks should be used. The technique is as follows: In order to give broader surfaces for cicatrization, and consequently greater strength, the incision is made into the sheath of the rectus muscle on that side on which the muscle was not exposed by the abdominal incision. If, perchance, the abdominal incision was made directly through the linea alba, without exposing a rectus muscle, the sheath is to be deliberately divided on either side with the scissors, as shown in Figure 89. This gives double fascial edges and broad muscular surfaces for union. The purpose of the buried suture is to approximate the muscular and fascial layers of the wound, so as to insure apposition of homologous parts, and to retain them in approximation long enough to secure firm union.

The running suture is preferable to the interrupted, first, because it brings corresponding structures more accurately and more quickly together; second, because the buried knots are decreased in number or entirely avoided. The second advantage is considerable, for the bulky catgut knot tends to cause suppuration and failure of union.

Closure of the abdominal wound by buried catgut sutures is made as follows:[2]

The needle is introduced at the lower extremity of the wound on

[1] George M. Edebohls. American Gynecological and Obstetrical Journal, May, 1896, consulted.

[2] Adapted from Edebohls.

the right side, and at the first thrust is carried through anterior fascia and muscle and peritoneum. As the needle emerges on the opposite side it includes peritoneum and muscle only; the fascia is not included. The suture is then continued as a running suture the length of the wound, and in turn unites the peritoneum, posterior fascia, and muscle. It is then carried back to the starting-point, whipping together the anterior fascial edges, from which it finally emerges on the

FIGURE 89.

FIGURE 90.

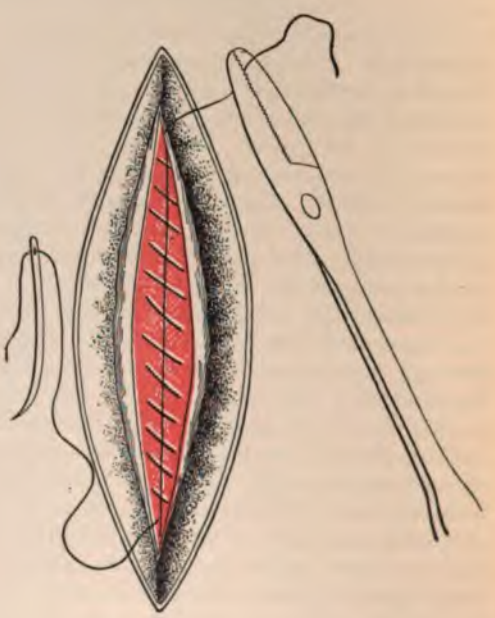


Figure 89.—Fascial sheaths of rectus muscle on one side, being split by scissors. Blue color represents peritoneum. Red color represents rectus muscle.

Figure 90.—Showing deep tier of buried running catgut suture. The suture embraces peritoneum, posterior edge of the divided fascia, and muscle. Red color represents recti muscles reunited by second tier of running catgut sutures.

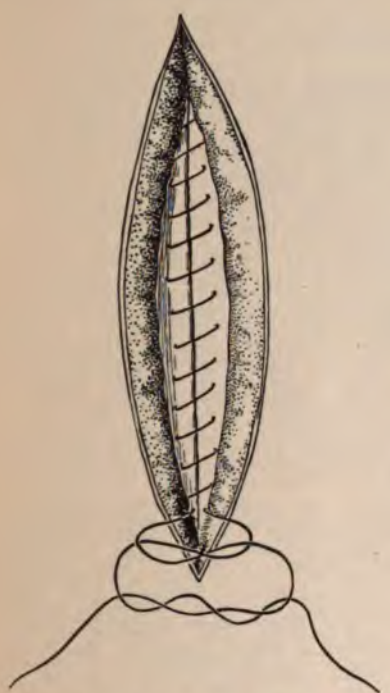
right side, and is tied. Figure 91. This is the only buried knot. The subcutaneous fat is not sutured; it falls into place and takes care of itself. The closure is completed by whipping together the margins of the skin, either subcutaneously or by means of the over-and-over stitch, with fine catgut. The subcutaneous suture is preferable. The writer has used both methods repeatedly in the same wound and observed suppuration in the part closed by the whip-stitch only. This doubtless comes from the staphylococcus epidermidis, which the subcutaneous suture does not render active.

In place of the chromicized catgut, the formaldehyde catgut may

be used. The latter resists absorption for five or six weeks. The closure is best made with No. 1 or 0 size gut. The method of the buried suture is most satisfactory, especially for long wounds, when the abdominal wall is thin.

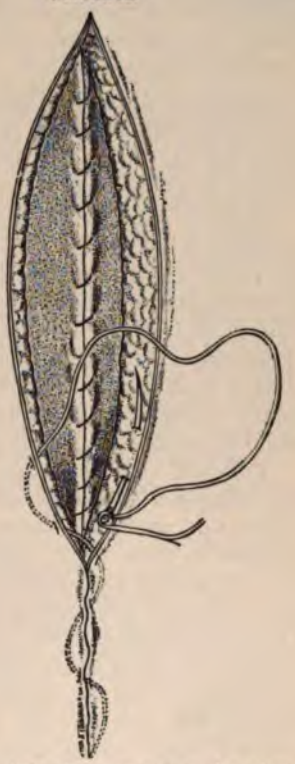
In operations for ventral hernia, the splitting of the sheath of the recti muscles and the buried suture will be found most effective.

FIGURE 91.



Fascial margins of wound closed by second tier of buried running suture. Sutures of the skin and fat are not represented. The knot is loosely made to illustrate proper manner of tying buried catgut, a single turn in the first half and a double turn in the second half of the knot. The recti muscles are now covered in by fascia.

FIGURE 92.



Subcutaneous suture, for closure of external margins of wound, being introduced. Deeper fascial sutures shown below. Dotted lines indicate buried suture in place. The needle used for the introduction of the subcutaneous suture should be more strongly curved,

Stitch-abscesses are very liable to occur unless the following precautions are observed:

1. The abdomen should be opened with a sharp scalpel which will make a clean cut, not a ragged, uneven incision.
2. Great care should be used during the operation not to bruise or tear the wounded surfaces.
3. All bleeding should be arrested before closure of the wound.
4. Absolute asepsis should be secured in hands, instruments, sponges, and sutures.
5. The sutures should not be drawn too tightly.

Should suppuration in the wound or along the sutures occur, the sutures, if of the through-and-through variety and tied on the skin, should be at once removed. The buried suture must be left in place until it is absorbed. A dressing, wet with a saturated solution of boric acid, two parts, and alcohol, one part, should be continuously applied. Free drainage by incision should, if necessary, be established. Immobilization of the abdominal walls by a firm bandage will tend to prevent separation of the suppurating wound.

Sponges.

In nearly every extensive abdominal section numerous sponges are packed into the abdominal cavity, not only to absorb blood and other fluid, but to control hemorrhage by pressure, and to hold the intestine and other viscera out of the way of the operator.

Sponges Lost in the Abdomen. It is quite impossible during the progress of an abdominal section for the operator to keep track of the exact number of sponges which may be inside of the abdomen; hence numerous humiliating, not to say fatal, results of closure of the wound and completion of the operation with one or more sponges remaining in the peritoneal cavity. The not infrequent occurrence of this deplorable accident, even at the hands of careful men, is the writer's excuse for introducing two personal experiences; verily, how much experience one may get from a single case!

The first case was one of extensive suppuration of the uterine appendages with nearly universal old, firm adhesions throughout the pelvis, and with the uterus enlarged by infectious endometritis and metritis to about four times its natural size. All the diseased organs were removed by abdominal and vaginal section. The operation, especially the hysterectomy, was exceptionally difficult and tedious. The broad ligaments were so short and thick as to be inaccessible for the ligature, and almost for the clamps. Each ligament was so thick that through the vagina it had to be clamped in three parts. The patient was put to bed apparently nearer dead than alive. The writer's usual precautions had been taken to prevent closing the wound with a sponge inside. The sponges had been brought to the operation in sterilized packages each containing eight, so that the number must have been eight or some multiple of eight. Only large, flat gauze sponges were used. The operation was begun with the eight sponges of one package, which were counted. Two additional packages of eight each were required in the course of the operation, all of which were supposed to have been accurately counted by the nurse in charge of them. Just before the abdominal sutures were introduced the nurse was directed to count the sponges. She reported them "all out." After the introduction of the sutures, and before they were tied, she was told to count them again, and this count also made the number twenty-four and "all out." With the evidence of a double count, that there could be no sponge in the abdomen, the wound was closed.

Three hours later the nurse reported that one of the gauze sponges

used in the abdomen could not be found. After consultation with two colleagues it was decided to assume for the time that the missing sponge had been lost outside the abdomen, and that consequently the peritoneal cavity was clear.

Convalescence was uninterrupted till the tenth day, when the stitches were removed. At this time there was noticed a semi-resonant mass of irregular ovoid shape, as large as a medium-sized orange, in the region of the right kidney; it gave to the palpating hand the sensation of a mass of gauze mingled with adherent intestines. Two colleagues agreed that it would be wise to wait for developments. Sixteen hours later, at 11 P. M., the mass had increased in size, become painful, the pulse had risen from 100 to 120, and the temperature from 99° to 101°. There was slightly increased distention, accompanied by a tendency to pronounced nausea. After a hasty consultation, the family being fully informed of our suspicions and fears, chloroform was hastily given and the abdomen opened directly over the mass. The incision was made without the usual assistants, by artificial light, at midnight, and revealed, not a sponge, but a much enlarged kidney surrounded and covered by firmly adherent intestines looped and matted together in an irregular mass. In working through the thickened, unrecognizable, adherent parietal peritoneum, and between the layers of visceral peritoneum and the adherent intestines, also thickened and difficult to recognize, the intestine was accidentally opened. The opening was immediately repaired with interrupted Lembert sutures, and the abdominal wound closed without drain.

Three days later the contents of the small intestine, probably the upper part of the ileum, came through the abdominal wound, and an intestinal fistula was thereby demonstrated. During the following five weeks no feces passed by the anus: all bowel evacuations came through the fistula. The opening was so high in the bowel that nutrition was seriously impaired and emaciation began. The fear of a formidable operation to restore the integrity of the bowel increased day by day. Finally, to the writer's unspeakable relief, in the sixth week fecal matter appeared at the anus. The fistula began to contract, and in a few days was completely closed. The kidney enlargement entirely subsided, and repeated urinalysis showed no evidence of functional impairment.

The prolonged anxiety and distress of such a case are beyond description. They are, both for the surgeon and for the patient, a life-shortening experience. The burden of this case was lightened, first, by the ultimate recovery of the patient; second, by the complete relief which she has since experienced from a distressing intestinal catarrh which had made her a semi-invalid for fifteen years. This relief is attributed to the continuous rest to which that portion of the bowel below the injury was subject while the fistula was open.

The second case was one of intra-ligamentous ovarian cyst on each side, with double sactosalpinx, serosa, and universal adhesions. The sponges were carefully counted before the incision was made. Before the wound was closed the nurse counted them again and reported one

missing. After a search of fifteen minutes among the abdominal viscera, the nurse in the meantime looking for the sponge outside, it could not be found. In the hope of finding the sponge, the incision, previously short, was then extended to the navel, preparatory to turning out the intestines, when the nurse found the sponge outside; it had been carelessly misplaced in a jar and overlooked. The patient fortunately recovered.

These two cases illustrate the degree to which a surgeon, with all the responsibility, may be powerless to protect his patient against the inefficiency or carelessness of an assistant whose shortcomings, perchance, he may be unable to discover until it is too late.

The precautions which may be taken in order, so far as possible, to guard against accidentally leaving a sponge in the abdominal cavity are as follows:

1. All sponges should be so large as not easily to be overlooked by the operator. If sea-sponges are used, let them all be the largest flat sponges, and of as nearly uniform size as possible. Gauze sponges are, however, preferable. They should be made of good absorbent gauze in four thicknesses, and should be of uniform size, at least six inches wide by twelve to sixteen inches long. All sponging can be done with large as well as with small sponges. Let the smaller ones, then, be discarded. They serve no useful purpose.

2. All sponges designed for abdominal section should be kept in packages of eight each. This number will suffice for the ordinary operation. If more are needed, additional packages may be opened. As soon as a package is opened, the sponges should be accurately recounted and recorded. This precaution will invariably fix the number for any operation at eight or a multiple of eight.

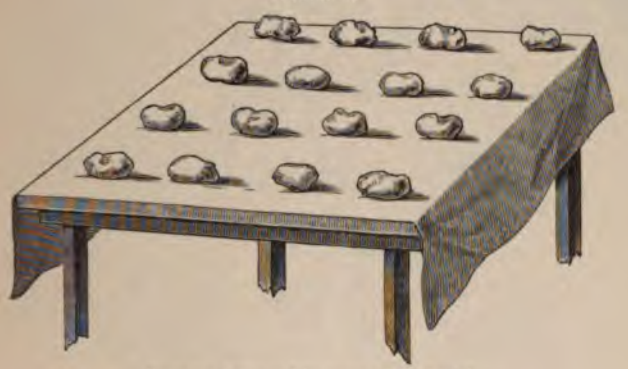
3. Toward the close of the operation the sponges should be again counted. Experience has shown that under the demoralizing influence of hurry and excitement which often go with the close of a desperate operation, the nurse in charge of the sponges is liable to blunder in the count. It is well, therefore, that the count be repeated two or three times, and, if possible, by different individuals.

Another practical means of avoiding the loss of sponges that may have been packed into the abdomen is to have them fastened together in groups of two by narrow strips of tape, the strips being about twelve inches long. One might readily overlook one sponge in the cavity, but he could hardly overlook two. Moreover, sponges fastened together in this way are easily counted when removed. The plan of attaching a single tape to each sponge and letting the end remain outside is objectionable, for many protruding strips of tape would be in the way of the operator, and, what is worse, one or more strips might accidentally slip in and be lost.

The operator, whose every energy is employed in the effort to shorten the time of operation, cannot stop for sponge-counting; yet only a surgeon can appreciate the satisfaction which lies in the absolute knowledge that every sponge is out. The writer, therefore, now uses a simple device by which the number of sponges may at a glance be apparent to any one. It is this: At the time of closing the wound

the sponges are arranged in rows of four each on a table covered with a sterilized towel. The subject is so urgent that, even at the risk of seeming triviality, the accompanying illustration is introduced.

FIGURE 93.



Sponges arranged in rows of four each.

There are manifest advantages in not having the sponges washed during the operation. A sufficient number should be provided, so that they may always be used dry, and discarded as soon as they are soiled. In this way the operator may dispense with one assistant, the sponge-washer, and so limit the danger of infection.

Dressing and Bandages. The ordinary combination aseptic dressing of gauze and wood-wool or cotton, secured by strips of adhesive plaster and a firm abdominal bandage, will suffice. The nurse should be cautioned to use care lest the dressing and bandage slip up and expose the lower end of the wound. If a vulva dressing is also used, it should be kept separate from the abdominal dressing, for otherwise fluids may pass by capillary attraction from one to the other; this may explain the fact that stitch-abscesses usually begin at the lower end of the wound. It is well to use two abdominal bandages, one to reach from the hips to the umbilicus or, if necessary, higher, and the other to lap over the lower part of this and reach to the middle of the thighs. The lower bandage keeps the dressing from slipping upward. It may be loosened for movement of bowels or urination.

In non-suppurative cases in which there is little probability that the wound will have to be dressed or otherwise disturbed, it is better to apply the dressings and secure them by perforated adhesive plaster, as shown in Figures 94, 95, and 96. The wound having been dusted freely with nosophen is covered first by a single layer of gauze. This gauze is made fast by means of collodion, as shown in Figure 94, *A*. In order not to confine any possible secretion which should escape from the wound, the collodion should surround, but should not cover, the line of union. On this layer of gauze is placed a layer of absorbent cotton, Figure 94, *B*; and over the cotton a second layer of gauze, Figure 94, *C*, which also is made fast by collodion. A few additional layers of gauze are now loosely placed over that part of the dressings

plaster instead of the usual abdominal binder, are as follows: 1, the wound is protected absolutely against exposure by the carelessness of nurses, who are prone to permit the abdominal binder to be displaced upward, and thereby to leave the wound exposed; 2, the dressings of the gauze and cotton, secured by collodion and covered by perforated plaster, give the patient much less discomfort than the ordinary cumbersome dressings of large quantities of gauze, cotton, and other absorbent materials, which are held in place by the conventional abdominal binder.

2. Vaginal Section.

The vaginal route for opening into the peritoneal cavity is often preferable. The incision may be made either anterior or posterior to the uterus—*i. e.*, between the uterus and rectum or between the uterus and bladder. The technique of the procedure varies within wide limits, and will therefore be described in the discussion of special operations. See Vaginal Section in the chapter on the Treatment of Pelvic Inflammation.

3. Sacral Resection.

Hysterectomy and other intra-pelvic operations have been performed through an opening made by resection of the sacrum after the method of Kraske. The value of the method has not been established. The reader is referred for further information to the literature of the subject by Kraske and others.[1]

[1] A description of the Kraske method may be found in a paper by E. E. Montgomery, Transactions of the American Association of Obstetricians and Gynecologists, 1891.

CHAPTER VII.

DRAINAGE IN MAJOR OPERATIONS.[1]

Two classes of drainage cases present themselves: first, cases which, up to the time of operation, are free from infection; second, cases in which infection has occurred previous to the operation. To the first class belong solid and cystic tumors and tubal pregnancies which have not become infected; to the second class belongs pelvic inflammation in its various forms and stages, such as inflammation of the Fallopian tube and ovary, including pelvic abscess, pyosalpinx, and infected tumors.

Drainage in Non-infectious Cases. In these cases the alleged indication for drainage is the removal of blood, serum, or other non-infectious fluids such as might otherwise accumulate in the peritoneum, and, if left there, become infectious. Both experiment and experience have shown clearly that the non-infected blood and serum which may accumulate in the peritoneum after a clean, adequate operation have little or no power for harm. Serum and liquid blood are rapidly absorbed. Coagulated blood may be absorbed, or it may become encapsulated and gradually removed by the action of leucocytes; or it may become organized and remain harmless for an indefinite period. Both blood and serum are excellent culture-media for microbes; hence the necessity to keep them non-infectious by aseptic surgery. The peritoneum has great power to resist infection, and is known to take up and dispose of large quantities of infectious material, even without drainage. Recent studies and experience prove that the drain is often more potent as a medium for the introduction of sepsis than for the removal of it. Drainage, therefore, after a clean operation in a case not hitherto infected, is contraindicated.

Drainage in Infectious Cases. Bacteriological examinations of reproductive organs removed for chronic inflammatory disease frequently show that the pus is sterile, or, if organisms are present, they may be inactive at the time of the operation.[2] "In forty-four specimens of ovaries and tubes, organisms resembling gonococci were found in six cover-glass preparations, but did not grow in cultures. The staphylococcus albus and aureus and streptococcus were found once in culture. With these exceptions, the forty-four cases were negative. Fifty-six uteri were examined, in none of which were organisms found in culture.

"These results in general coincide with the reports of Menge,

[1] One of the most valuable contributions yet made to the subject of peritoneal drainage is from the pen of Dr. J. G. Clark, Resident Gynecologist in Johns Hopkins Hospital. The author has made numerous adaptations from this paper. See American Journal of Obstetrics, May, 1897.

[2] Clark. American Journal of Obstetrics, June, 1897.

Schauta, Reymond, and Magill.[1] In the examination of one hundred and forty-four cases by Schauta, streptococci and staphylococci were found four times. Menge has observed the staphylococcus once in twenty-six cases, and Morax once in thirty-three cases. Cases of pneumococcus infection have been reported by Zweifel, Frommel, and Wertheim. A fatal pneumococcus peritonitis followed the infection in certain cases of Frommel and Witte. Reymond and Magill believe that a salpingitis may be produced by the colon bacillus, and think that it gains entrance through adhesions or through close propinquity to the intestine." From general review of the bacteriological conditions in these cases, we conclude that at the time of operation the initial infecting organism has largely disappeared and that infection of the peritoneum from the diseased area is therefore not likely to occur.

Formerly the escape of the smallest quantity of pus into the peritoneum during an operation was considered an imperative indication for drainage. Now, it follows from the foregoing paragraphs that even large quantities may escape and, being perfectly free from virulent or active microbes, not call for drainage.

Comparison of Results. Large numbers of drained pus-cases and equal numbers of like cases not drained uniformly show a strong preponderance of recoveries in the non-drainage series. This preponderance is convincing proof that the drainage was at least useless. The larger mortality in the drained cases is attributable to infection introduced through the drain.

Evil Results of Drainage. In addition to the greatly increased danger already mentioned from the direct introduction of infection through the medium of the drain, the following evil results are not infrequent:

1. Obstruction of the bowel.
2. Fecal fistula.
3. Vesical complications.
4. Hernia.

1. *Obstruction* may occur from adhesions set up by the irritating presence of the drain. An adherent intestine sharply kinked may suddenly become impermeable, or gradually contracting bands may slowly shut off its lumen. Most frequently the obstruction is partial, and gives rise to constipation and griping pains for days or weeks after the operation. In such cases, when fatal, the autopsy has usually shown the intestines matted together around the drainage cavity in an unrecognizable mass.

2. *Fecal Fistula* is the occasional result of necrosis from direct pressure of the drain. The irritating presence of a gauze drain may contribute to an inflammation so destructive as to produce necrosis and consequent fistula. If the bowel has been opened during an operation, and has been well repaired, the drain is unfavorable to union and is contra-indicated. If, however, the intestinal opening has been made deep in the pelvis, or is otherwise so inaccessible as to prevent thorough suturing; if, in a word, union is improbable, the drain is indicated as a means of exit for fecal matter.

[1] Annals of Surgery, 1846.

3. *Vesical Complications.* The territory to be drained is usually in close relation with the bladder. Inflammation around the drain, therefore, may give rise to adhesions between the bladder and adjacent organs, or may invade the bladder; in either case vesical disturbance more or less severe may arise.

4. *Hernia* in drained cases is much more common than is usually supposed. This is because the drain separates the fascial sheaths of the recti muscles and other surfaces which otherwise would immediately unite; the small breach thus made in the wall increases, and more or less hernia is the result. Hernia less often results from vaginal than from abdominal drainage.

To Prevent Infection, and thereby to avoid the necessity for drainage, is an essential purpose of every abdominal section. The subject may be summed up in the proposition that the operation should be performed in such a way as not to require drainage. This involves the following precautions:

1. Insure thorough asepsis of hands, instruments, and other appliances. See Chapter II., on Antiseptics and Asepsis.

2. Wherever the peritoneum is injured or sacrificed, let the injured part, if possible, be covered by adjacent peritoneum. This may require numerous sutures and careful plastic work.

3. Control hemorrhage, if practicable, even to small oozing points. This, for want of time or for other reasons, may be impracticable. It may then be safe to leave small accumulations to be taken up by the peritoneum rather than by a drain.

4. Avoid all unnecessary injury to the tissues. All traumatisms favor sepsis. Do the operation adequately, but with the least possible amount of operating.

5. As a most important precaution, let the bowels be evacuated thoroughly before beginning the operation. Even a quantity of gas in the bowel is a source of danger.

If, during the operation pus ruptures into the peritoneal cavity, it should be removed as soon as possible by careful sponging. If the pus is sterile, the sponging is sufficient. If there is reason to fear that it is septic, the peritoneal cavity should be freely irrigated with a normal salt solution, six-tenths of one per cent. Clark[1] advocates thorough peritoneal irrigation whenever any pus comes in contact with the peritoneum. He says: "For the last three years it has been our custom not only to irrigate the abdominal cavity thoroughly after all operations where pus or other fluids have escaped, but frequently also to leave as much as one litre of salt solution in the peritoneal cavity before closing the abdominal wound." The writer cannot too strongly urge the retention of considerable salt solution in the abdomen after irrigation. It is rapidly absorbed, and thereby not only carries out septic matter, but increases the arterial pressure. Moreover, the filling of the abdomen with fluid displaces the air that would otherwise be retained in the peritoneal cavity after closure of the wound.

The usual method of flushing out the abdominal cavity by means

[1] American Journal of Obstetrics, May, 1897.

of normal salt solution poured through the wound into the cavity from a pitcher or flask is in many cases quite inadequate, because the cavity may be so filled with viscera that the solution thus introduced cannot reach the deeper portions of the abdomen or pelvis. This is especially true in cases of short incision. In order to make the flush-

FIGURE 97.

Apparatus for flushing out abdominal cavity, consisting of a metallic funnel-like reservoir with two handles to be held above the level of the patient. A rubber tube three-fourths of an inch in diameter leads from the reservoir. At the end of the tube may be attached a canula, or as shown in the figure a forceps, for the purpose of carrying the solution to the deeper parts of the peritoneal cavity.

ing effective, the solution may be introduced through a canula attached to a rubber tube, the tube leading from a reservoir above. The end of this canula can be passed through the wound and made to transmit the solution thoroughly to all parts of the peritoneal cavity. A very practical substitute for the canula is shown in Figure 97. The salt solution is held in a funnel-like metallic reservoir, to which is attached

a rubber tube at least three-fourths of an inch in diameter. At the end of this tube is fastened a long straight pressure-forceps, as shown in Figure 97. By means of this forceps the end of the rubber tube may be carried into any part of the peritoneal cavity, and the solution rapidly and thoroughly introduced in very large quantities. During the process of flushing additional quantities of solution may be poured from pitchers into the metallic reservoir. By this means many gallons of solution may be readily and rapidly brought in contact with every part of the peritoneal cavity.

It is a well-known principle in physics that a substance will undergo combustion or solution much more rapidly in a finely divided state than when it is massed together. The same principle may be applied to the disposal of foreign matter in the peritoneal cavity. In Muscatello's experiments the leucocytes could easily surround the smaller foreign bodies and carry them into the general circulation through the spaces in the diaphragm; where the bodies were larger, many leucocytes were required for this task, and the removal of still larger particles could only be accomplished after their encapsulation and subsequent slow disintegration by the leucocytes. His experiments also demonstrated that there existed an intra-peritoneal current capable of transporting carmine bodies, even against the force of gravity, from the pelvis to the diaphragm. When to these conditions we add the proved fact that the normal peritoneum can take care of a large amount of infectious matter without danger to the animal, it appears that there can be no question that it is better to disintegrate and distribute infectious matter rather than allow it to remain in a localized area."[1]

The general indications and contraindications for drainage will appear from the foregoing paragraphs to be as follows: In a clean operation, one in which not only the pus, but also the sac containing it is removed, and in which therefore no diseased surfaces are left open to secrete septic matter and keep up the supply, drainage is contraindicated. The non-septic fluids and, to a limited extent, the septic fluids, will be taken up and disposed of by the peritoneum more safely than by the drain. On the other hand, when pus-producing surfaces are left without drainage, they may continue to be a persistent source of infection, and the supply of septic matter may be greater than the peritoneum can take up. Then one of two results must follow: either adhesive peritonitis is set up around the diseased parts, and the infected territory is walled off by plastic effusion; or the micro-organisms and their poisonous products are spread throughout the peritoneum, and thence poured in fatal quantities into the general circulation. Under these conditions drainage is indicated at the time of operation. If, after operation, purulent fluid becomes walled off, no time should be lost in opening and draining the abscess The indications for drainage are:[2]

1. General septic peritonitis.

2. The presence of a nidus of infection whence septic matter must continue to be propagated. This may be an open intestine, an abscess,

[1] Clark.
[2] Adaptation from Watkins. American Gynecological and Obstetrical Journal, March, 1896.

a cyst, an infected hæmatocele, or a large amount of necrotic tissue which cannot be safely removed. The indication may be clear when old and extensive adhesions are present, when an abscess or an infected hæmatocele occurs in the pelvic cellular tissue, or when a cyst is so firmly adherent and necrotic that it cannot with safety be entirely removed. In these conditions the drain gives an outlet for the septic fluid and the broken-down necrosed tissue.

3. Hemorrhage which cannot be controlled by suture, ligature, temporary pressure, or hot sponges.

Different Forms of Drainage.

Tubular Drainage is usually through soft rubber or small glass tubes. For drainage through the vagina rubber is preferable to glass.

FIGURE 98.

Vaginal gauze drain extending from Douglas's pouch to the vulva for capillary drainage.

The tube is especially useful as a medium for drainage and for washing out septic cavities, such as abscesses which have been walled off from the general peritoneum. The presence, however, of a tube in the peritoneal cavity usually causes in a few hours the surrounding organs to be fused together. The space which the tube occupied is then isolated from the remainder of the peritoneum, and is the only space which it can possibly drain. For this reason tubular drainage in the abdomen has been largely discarded.

Capillary Drainage. The continuous strip of gauze has been extensively used for capillary peritoneal drainage through both the

vaginal and the abdominal wound. As stated in the foregoing paragraphs, it is applicable to the second and third indications for drainage.

There are two principal indications for the use of gauze packing in abdominal and pelvic operations: 1. Hemorrhage which cannot be practically controlled in any other way without unduly prolonging the operation; the packing then used is immediately a compress, but if left longer than is necessary for hemostatic purposes it becomes a capillary drain. 2. The desirability of quarantining the field of operation from the general peritoneal cavity. The rapidity with which adhesions form around the packing is well known. In a few hours the septic area is shut off from the general peritoneum by adhesions, and in this way septic fluid is walled off and mostly confined within narrow limits.

The above use of the gauze should not be confounded with its use as a drain. The value of gauze for drainage as usually understood—that is, for the removal of any fluid which may form in the peritoneal cavity—is probably overestimated. The peritoneum has often demonstrated its ability to take care of large quantities of secretion. If, as many assert, it be true that the presence of a drain excites the secretion of large quantities of fluid which would not otherwise be secreted at all, it follows that the drain is often not so necessary as the large quantities of fluid which it carries off seem to indicate. Clearly it would be absurd to use a drain for the purpose of carrying off secretions which it had itself produced. Moreover, the gauze packing often acts as an obstruction to the removal of fluids, and may therefore, if required as a drain, have to be used in conjunction with tubular drainage.

Abdominal Drainage, if employed, may be either by the tubular or by the capillary method. The route from the pelvis to the abdominal wound is long and in close relations with the bladder, intestines, and omentum, which organs should have no necessary relation with the field of operation, but which, from contact with the drain, are unfortunately liable to infection, adhesions, perforation, and hernia. Moreover, the long sinus left after the removal of the drain is often slow to heal, and its outer end is prone to contract rapidly and leave in the pelvis a troublesome, undrained or imperfectly drained pocket. For these reasons the abdominal route is objectionable.

Should it be necessary to drain through the abdomen, a small glass tube or gauze may be used. The former should be long enough to reach to the bottom of the pelvis, and is kept from slipping into the abdomen by a flange at the outer end. This form of drainage may be useful in operations for peritonitis and for the removal of serous effusions. The wound is dressed by packing gauze over it and around the protruding portion of the tube. A perforated thin sheet of rubber dam is snapped over the flange and a mass of absorbent cotton is placed over the end of the tube and enveloped in the rubber dam. The cotton absorbs all the drainage-fluid. It should be renewed often enough to keep it dry. The rubber dam confines the drainage-fluid to the cotton and thereby protects the dressings proper from moisture. The fit time for the removal of a drain is when it

ceases to drain or when little fluid comes through it. In draining for non-suppurative cases the first fluid is usually a dark bloody serum. When this diminishes in quantity and becomes light colored or colorless the drain should be removed. A glass drain should be turned around twice daily. This is to prevent parts of the omentum from working their way into the small holes at the inner end of the tube. Such an accident may give great trouble in the final removal of the tube. On this account it is better to use tubes with only the large openings at the two ends, and without the small perforations.

FIGURE 99.

Keith's small glass drainage-tube.

Vaginal Drainage. The route from the pelvic cavity to the vagina is short and direct; hence the vaginal drain is generally preferable. If in the operation an opening between the pelvic cavity and the vagina has not been made, and drainage is necessary, it is often better to make the opening for that purpose. The great advantages of the vaginal route are: 1, minimum risk of hernia; 2, natural and dependent drainage; 3, more satisfactory convalescence. The safety of this route, as shown by experience, depends largely upon the previous thorough disinfection of the vagina.

The manner of introducing a gauze drain, whether abdominal or vaginal, is as follows: The end of a continuous strip of double gauze, with the edges turned in and stitched together to prevent fraying, is doubled backward and forward upon itself, like the folds of a fan, from the part to be drained to the surface. Over this an external dressing is placed and changed as often as it becomes saturated. Figure 98 shows a vaginal drain in place.

The time for removal of gauze varies with the purpose for which it was used: if to control hemorrhage, it may be removed in twenty-four hours; if for drainage, it may be left five days, unless, as occasionally happens, it acts as an impediment to drainage. The writer repeatedly has observed patients to show signs of septic absorption on the second or third day after an abdominal operation, when removal of the gauze was followed by a gush of pent-up fluid and prompt relief of all urgent symptoms. It is not usually necessary, after removal of the original drain, to introduce fresh gauze. If at any time the opening tends to contract too rapidly, or drainage becomes imperfect, the gauze may be renewed or a tube may be inserted.

The classical dictum is, or has been, "When in doubt, drain." If, however, the irritating influence of the drain is to cause the secretion of fluid, which otherwise would not be secreted; if the peritoneum, left to itself, is capable of taking up and disposing of large quantities of fluid, even, to some extent, of septic fluid; if the drain is more prone to introduce than to carry out sepsis—then the dictum may have to be reversed, "When in doubt, don't drain."

CHAPTER VIII.

AFTER-TEATMENT IN MAJOR OPERATIONS.

After-treatment in Simple Cases.

THE great majority of abdominal sections, if properly performed, are followed by normal convalescence, and therefore require little active treatment.

Rest, bodily and mental, is the first consideration. The patient is to be placed in a bed previously warmed by means of hot-water bottles or bags. If there is a tendency to shock, the warm applications should be left around her. The careless use of hot-water bottles or rubber bags before recovery from the anæsthesia has occasionally resulted in serious burns. In one case the writer observed an enormous blister on the outer surface of each thigh; in another, on the sole of the foot. Both patients sustained deep sloughing of the cutaneous and subcutaneous structures, which finally required extensive skin-grafting. As the freezing of water in a pipe more readily takes place when there is no circulation, so in conditions of shock, when the circulation is feeble, burns are more liable to occur.

The patient is usually kept on the back for two or three days. She is apt to attribute to this position the inevitable pain and discomfort from the anæsthesia and the operation. It may then be wise, if she insists, to turn her on her side. If she does not have the expected relief, she will then more readily assume the dorsal position and more patiently wait for the natural subsidence of pain and discomfort, which, if all goes well, a little time is sure to bring.

Rest for the stomach is desirable. A variable degree of irritability of the whole digestive tract is the common result of anæsthesia, especially in cases of abdominal section. The vomiting and nausea of this state are rather increased than diminished by drugs, food, and drink. The only treatment is to withhold them until the toxæmia of the anæsthesia has passed off. In some cases the exception may be made of giving slowly a teacupful of hot water. This may be promptly thrown up, but it will wash out the stomach and, perchance, give a little relief. The knees may be drawn up into the most comfortable position and supported on a pillow or roll. The judgment and discretion of a wise nurse will furnish a guide more useful than the most elaborate rules. The best nurse will move, when possible, along the lines of least resistance, or, when necessary, will use a gentle firmness that inspires confidence. She will carry her patient past the critical period with the minimum of friction and discomfort. The exclusion of relatives and friends from the bedside is usually imperative, and will not be difficult if properly managed. They

have, perhaps, travelled long distances, and seriously believe that the comfort and consolation which they alone can give are highly essential to the patient's recovery. They must be told in kindly but positive words that the results of experience in thousands of cases demonstrate the necessity of absolute quiet; that the presence of the husband, the mother, or other near relatives excites emotion; that emotion consumes energy, of which the patient has none to spare. Such a statement is usually sufficient; if not, the surgeon must enforce whatever regulations the welfare of the patient may demand. If she becomes restless and anxious because the relatives are kept out, it may be well to admit them. Most patients, however, during the first two or three days do not ask for them, and many prefer not to see them. Frequent sponge-bathing, care to keep the bed-clothing under the patient smooth, and such other minor attentions as only a good nurse can suggest, all contribute to the desired end—rest.

The Bowels. If the temperature, pulse, and respirations are normal, or nearly so, and there is no abdominal distention nor other unfavorable sign, movement of the bowels may be deferred until the second day; then they should be moved by an enema or a mild cathartic. Some surgeons commence immediately after the operation with half-grain doses of calomel given every half-hour until eight or ten doses have been given or the bowels act. If there is no action, the calomel is immediately followed by a saline purge, or an enema, or both.

Early catharsis is a good precaution against sepsis and peritonitis, and may be used in all cases in which these complications are especially feared. In perfectly normal cases it is unnecessary. Early movement of the bowels, however, is desirable in all cases. After the initial movement they should be kept regular by cathartics or enemas, or both.

The Bladder. Great caution is necessary to protect the patient against the deplorable accident of overflow of the bladder. Frequent urination should always excite suspicion, and should be regarded as an urgent indication to pass the catheter.

Pain of variable degree is usually present during the first day or two. Opium and its preparations lock up the secretions, induce nausea, arrest peristalsis, cause distention, and mask any symptoms which otherwise might give warning of approaching danger; they, moreover, counteract the influence of cathartics, and would therefore prove a serious obstacle if it became necessary to move the bowels. Such drugs, if given at all, should be given with great circumspection. Phosphate of codeia creates less nausea, constipation, and other disturbances, than opium or morphine; the hypodermic use of it in half-grain doses is sometimes permissible, during the first twenty-four hours, to allay nervous irritation and pain and to insure needed rest. There are conditions of great nervous irritation in which morphine in full doses is strongly indicated. See Hysterical Vomiting, Chapter VIII.

Thirst. "Oh, for a good drink!" is one of the first calls. The common practice of withholding water as a routine is not to be commended. In the absence of nausea it may be given cold or hot in

moderate, even in satisfying, quantities. The amount may be left to the discretion of an intelligent nurse. Charged waters, ginger ale, champagne, and other such drinks, while permissible, are not usually required, and may do harm.

Food. Except in cases of exhaustion, food is to be withheld for one or two days. It is usual to commence feeding after the bowels act or flatus passes. Eructations of gas from the stomach are an indication for withholding food. The downward passage of flatus is a good prognostic sign. "*Qui crepitat vitat.*" The diet for the first few days is preferably milk, with or without lime-water, beginning in small doses and, according to the tolerance of the stomach, gradually increased. A teaspoonful at a time may be given at first, and repeated in thirty minutes. If this is tolerated, the doses may after a few hours be doubled, and so on till several ounces at a time are given. Finally, after two or three days, if all goes well, the amount may be largely increased until full quantities are taken.

Getting Up. The patient may sit up about the end of the third week; if the incision was long and the union is not quite firm, she should be kept in bed longer.

After the sutures have been removed the wound is to be dressed as before, except with progressively lighter dressings, for a period of two weeks. The new cicatrix should be supported first by straps of adhesive plaster, and later, when the patient begins to walk, by a properly adjusted elastic bandage. A variety of suitable bandages may be found at the instrument or drygoods shops. The bandage should be worn continuously in daytime for six months. A lighter flannel bandage may be used at night.

After-treatment in Complicated Cases.

Shock associated with abdominal section is the same as after other operations and injuries. If it occurs during the operation, use at once the extreme Trendelenburg position, and flood the peritoneal cavity with a quart or more of normal salt solution, six-tenths of 1 per cent., at a temperature of 105° F., and complete the operation as soon as possible. After the operation elevate the foot of the bed. Among other measures for the treatment of shock are the application of dry heat to the surface; the hypodermic administration of strychnine sulphate every four hours in doses of one-thirtieth of a grain each; the free hypodermic use of whiskey, at least four drachms every hour; the hypodermic injection of two grains of camphor dissolved in ten minims of sterilized olive oil, to be given every hour; and copious high rectal enemata of warm normal salt solution, to be retained if possible. Shock is most apt to occur when considerable blood has been lost during the operation; whether from this cause or not, the urgent indication is to fill the bloodvessels, and thereby increase arterial pressure. The most effective means to this end is hypodermoclysis; this is the infusion through an aspirator-needle of large quantities of normal salt solution directly into the tissues. It is usual to introduce deeply under each breast at least eight ounces, and, if indi-

cated, to repeat in the outer thigh or abdominal wall. See Hypodermoclysis.

Secondary Hemorrhage. It is often difficult to differentiate hemorrhage from shock. The former, if post-operative, is usually slow and may not declare itself until several hours after the operation. The latter more commonly begins some time during the operation.

Diagnosis. The symptoms of hemorrhage are well known. The patient has, perhaps, rallied well from the operation, with good pulse and temperature. Presently, or within a few hours, there are symptoms of approaching collapse—*i. e.,* rapid, thready pulse, subnormal temperature, pallor, sighing, gaping, and cold surface. If these symptoms appear, the presence of much clotted blood in the drainage-tube may clear the diagnosis. The gauze drain would show a stain of deeper red than ordinary blood serum should make. Both of these signs, however, may fail.

If there is no drain, one may often work a small glass female catheter through the wound between the stitches. Hemorrhage would then declare itself by the presence of clear blood in the catheter. In cases where hemorrhage was feared the writer has occasionally tied the sutures in bow-knots. This facilitates the reopening of part of the abdominal wound for diagnostic purposes and obviates the necessity of reintroducing the sutures.

Treatment. To reopen the wound, find the source of hemorrhage, apply a ligature or a pressure-forceps, sponge or wash out the cavity, and close the wound with the patient bordering on collapse, is, indeed, a serious undertaking. If, however, there is hemorrhage, any other attempt to check the bleeding is not only useless, but a dangerous waste of time.

Hypodermoclysis. Next to the ligature, the most effective means of combating the results of hemorrhage is the hypodermic injection of large quantities of normal salt solution. The strength, according to Bacon, should be not, as generally directed, six-tenths of one per cent., but about eight-tenths—*i. e.,* eight parts in one thousand. An even teaspoonful of table salt in a pint of water is a safe and reliable approximation to the required strength.

The technique of this simple and most valuable procedure is as follows: The saline solution and the apparatus for its injection are sterilized by boiling. The solution having been boiled, is now cooled to the proper temperature, say 110° F. The surface through which the needles are to be introduced is sterilized, and the needles, as shown in the diagram, are thrust deeply into the cellular tissue under the skin. The solution flows from the bottle or funnel by its own weight. An elevation of four or five feet is necessary to make the fluid flow freely. Constant gentle massage over the injected area will promote the distribution and absorption of the fluid. Ten or fifteen minutes will usually suffice for the introduction of a pint of solution. If the apparatus shown below is not available, a glass funnel attached to a large hypodermic needle by means of a long rubber tube is an adequate substitute. The fluid passes rapidly into the circulation, immediately increasing the arterial pressure; the procedure gives rise to little or no

pain. It is sometimes necessary, after an exhausting hemorrhage, to inject at intervals as much as three or four quarts in a single day.

The prime indication to increase arterial pressure is ordinarily more safely and quite as effectively fulfilled by this method as by the direct injection of blood or salt solution into the vessels. When the loss of blood has amounted to between one-fourth and one-half of the entire quantity, some prefer to throw the solution directly into a vein. This demands the greatest care in asepsis and extreme precaution against the introduction of air. High rectal enemata of salt solution are useful, but less rapidly effective than hypodermoclysis.

The hemorrhage having ceased, the subsequent treatment is the

FIGURE 100.

Apparatus for hypodermoclysis. The funnel contains twenty ounces. A rubber tube, with shut-off attached, connects it with a Y-shaped glass tube. Two small rubber tubes connect this with large aspirator-needles or large hypodermic points. The injection may be made into the thighs, abdominal wall, or under the breasts. The submammary region is usually selected."[1]

same as that for shock. If food is not tolerated by the stomach, rectal alimentation should be used every four hours. A good combination for this purpose consists of the white of an egg, three ounces of peptonized milk, and one ounce of whiskey.

Sepsis. The phenomena of sepsis are often considered under the name peritonitis. There are two varieties: first, plastic or adhesive; second, exudative. In the plastic variety adhesions may form around

[1] Dr. C. S. Bacon. International Clinics, vol. i., Second Series.

the diseased area; in this way the infection may be shut off from the general peritoneum and confined within narrow limits. In the exudative variety the plastic or defensive action is absent or inadequate, and the infection therefore spreads throughout the peritoneum and sets up a rapid and fatal blood-poisoning. It is a mistake to attribute the evils of sepsis to the associated peritonitis. The inflammatory process is an effort of nature to protect the general system against infection: if plastic and adhesive, it may succeed; if exudative, it usually fails. It is the infection that specially endangers life, not the associated peritonitis, which may or may not save it. Sepsis, then, or, to use a better term, infection, may be clinically classified as follows:

1. Localized infection.
2. General infection.

1. *Localized Infection.* This usually finds its expression in the form of an abscess at the seat of the operation. It may be around an infected pedicle, suture, or ligature. The nidus may be a surface laid bare in the operation and not covered by peritoneum, or it may be pathological tissue which could be, or at least was not, removed.

The symptoms are those of septic absorption: they are rapid but usually strong pulse, variable elevation in temperature, localized pain, sweats, chilly sensations, with little or no tendency to collapse. Examination will usually show a progressively enlarged swelling in the pelvis. This is usually felt by conjoined examination. Stitch-abscess may give rise to the same symptoms, but usually in less degree.

Treatment is simple and satisfactory. Under anæsthesia the abscess should be promptly opened and drained. The drainage-channel is usually through the incision by which the peritoneum was entered in the original operation—*i. e.*, through the abdomen or vagina. If a drainage-tube is already in the wound, there may be spontaneous rupture of the abscess into the tube. In an aggravated case it is sometimes best to make through-and-through drainage from the abdominal wound to the vagina. Rubber tubes, not gauze, are best for drainage.

2. *General Infection of the Peritoneum*—*i. e.*, exudative peritonitis, so-called—is fatal. Every abdominal surgeon is painfully familiar with the characteristic symptoms. He has descried them from afar as one may discern the dark cloud upon the horizon. In the balance between hope and fear he has watched the anxious face, the drawn expression, the progressively rising temperature, the nausea, at first attributed to anæsthesia, then as this subsides the vomiting of sepsis which takes its place, the frequent regurgitation of bile mixed with blood and mucus and growing darker and darker. He has recognized the gradual failure of the pulse, first weak, then running, then thready to the vanishing point, the paretic and distending bowels, which refuse to act, the rapid respirations, the cold extremities, the staring eyes, the wide nostrils, and, finally, the inevitable collapse.

Treatment is utterly useless. The symptom-group just outlined may, however, be present in less grave conditions, among them the local, circumscribed infection above described. Bowel distention, vomiting, fever, and rapid, weak pulse may be also due to causes

other than general peritoneal infection. In view of this possibility, therefore, active treatment may be indicated.

The first effort should be directed to the movement of the bowels. Try calomel, one-half grain, every half-hour until the bowels have acted. Let this be followed, if necessary, by the solution of citrate of magnesium, a wineglassful every fifteen minutes, or more if the stomach will tolerate it. Copious rectal enemata may stimulate the bowels to act, or at least to expel the flatus. The enemata may be of stiff Castile soapsuds, with a drachm of turpentine thoroughly mixed in each pint. It may be a mixture of glycerin, Epsom salt, and water, each two ounces, or a quart of olive oil or linseed oil. A large enema should be given slowly through a long rectal tube introduced as high as possible, with the patient on the left side. The muscular walls of the bowel in this condition are generally paretic; hence the great difficulty in stimulating them to contract and by peristalsis to expel their contents.

Whiskey, strychnine, camphor, ammonia, rectal alimentation, and other supporting measures, as described for the treatment of shock, may be used in moderation. Under such management patients with symptoms like those of general peritoneal infection may recover.

The free use of powerful toxic drugs, as a routine practice, is deplorable; desperate conditions do not necessarily call for desperate measures; these drugs, unless used with the best judgment, may take away the only remaining chance for life from a patient already overburdened with the toxæmia of sepsis.

Hysterical Vomiting. In about 1 per cent. of abdominal sections the operation is followed by vomiting, frequent, violent, prolonged, and exhausting. The nervous depression is profound; the pulse may rise to 170 or 180 to the minute. The condition may continue for several days, with final recovery, or may pass into collapse. The pathology of this phenomenal nerve-storm, with the stomach for the storm-centre, is unexplained. It may be due to toxæmia, or to local irritation similar to that which produces the vomiting of pregnancy. The causes are widely different from those of the sepsis above described. There is little or no fever; the temperature may be subnormal, as in shock; the bowels are seldom distended. There is simply colossal, almost incessant, vomiting. Starvation and the violent exertion of the vomiting soon exhaust the patient. The relation of the stomach disturbance to the associated nerve depression may be causative, concurrent, or resultant.

Treatment. The vomiting sometimes suddenly ceases without apparent cause. The removal of the sutures or of a drainage-tube has been followed by prompt relief. In one case in the writer's practice the vomiting promptly and permanently ceased upon simply re-opening the lower end of the abdominal wound; nothing abnormal was found, and the wound was again closed.

The diagnosis once made to the exclusion of septic peritonitis, the treatment is simple and effective. It is the free hypodermic use of morphine in doses sufficient to allay all nervous irritation, to induce

sleep, and, above all, to give the stomach and bowels rest. Under the influence of morphine food is retained, and in two or three days the patient recovers. The indication also is for hypodermic injections of strychnine, one-thirtieth of a grain every four hours, and for rectal alimentation.

Obstruction of the Bowels as a post-operative accident is not uncommon.

Causes. In addition to non-surgical causes which may at any time be present, there are those causes that result directly from the operation. The bowel may be bent sharply upon itself—*i. e.*, knuckled so as to make occlusion at the point of flexure. If at the same time adhesions form at or near the point of flexure, immobilization takes place; the bowel cannot straighten itself, and the obstruction is established. Sometimes a part only of the circumference of the bowel is constricted either in a hernial opening—Littré's hernia—or between bands of adhesion. The diverticulum looks like a nipple as it protrudes from the convex surface of the intestinal loop. On relieving the constriction the nipple disappears, leaving a deeply indented, dark blue ring. This form of hernial obstruction is partial, and therefore less severe than when the bowel is entirely occluded. Vomiting is less free and less apt to be fecal. Flatus in small quantities may continue to pass. The downward passage of feces is not always wholly interrupted. In cases of vaginal section when the wound is left open and the gauze drain used, the space occupied by the drain may upon the removal of the drain receive a mass of intestine. The result may be adhesion and obstruction. Occasionally a loop of bowel works its way between the margins of the wound and becomes pinched, occluded, and adherent. This is not a very infrequent result of capillary vaginal drainage. The evils of drainage have been more fully stated in Chapter VII.

Clearly, adhesions are more apt to occur between surfaces not covered with peritoneum; hence the importance of careful plastic work during the operation, to cover, so far as possible, all exposed surfaces.

Acute obstruction frequently has followed the use of solid food too soon after an abdominal operation.

Diagnosis and Prognosis. It is important to distinguish mechanical obstruction, due to kinking, intussusception, or adhesion on the one hand, from mere failure of the bowels to act on the other. The two conditions may so closely resemble one another as to make the distinction impossible. Reverse peristalsis and consequent fecal vomiting, a common symptom of obstruction, seldom occurs in paresis. The bowel may be paretic from a grave cause like septic peritonitis, or from some trivial cause.

The diagnosis is the same as for obstruction of the bowel from other causes. Nausea, vomiting, first of bile, finally of feces, abdominal distention, and rapid pulse are among the prominent symptoms. Peritonitis is first local and confined to the affected part; but later may become general. Death usually follows within a few days, unless the patient is relieved by surgical means.

Treatment. Before proceeding to the dangerous operation of reopening the wound and looking for the cause of obstruction an attempt should be made to secure relief by means of high rectal enemas, cathartics, and position. In an aggravated case of apparent mechanical obstruction in which the abdomen is distended to the size of full-term pregnancy and strenuous attempts to secure action of the bowels by means of enemas and cathartics have failed, the following measures may give prompt relief: 1. Croton oil, one-half drop to one drop; 2. A hot stupe of 25 per cent. turpentine covering the entire abdomen, the dressing over the wound having all been removed in order that the stupe may be applied directly to the skin; 3. Frequent change in the position of the patient, especially turning on the abdomen.

The diagnosis of mechanical obstruction once established, no time should be lost in the attempt to relieve the bowels. If the obstruction has been continuous for thirty hours, and upon reopening the abdomen the operator cannot immediately locate the cause of it and promptly open the way through it, the safer treatment would be to establish an artificial anus, even though a later operation may be necessary to restore the integrity of the bowel and close the sinus.

Obstruction and paresis are much less likely to occur if the bowels have been relieved thoroughly of feces and gas before the operation. See Preparatory Treatment in Chapter II.

Sinuses. The *localized* infection described in a former paragraph commonly subsides on drainage. Sometimes the source of infection is continuous; then the drainage-track becomes a sinus, and may continue to transmit pus until the infective substance is removed. This substance is usually an infected ligature or intra-abdominal suture which refuses to be cast off. It may remain for months or years a continual nidus of infection and suppuration, or may at any time come away. Spontaneous closure of the sinus upon removal of the infective substance is the almost invariable rule. If not spontaneously thrown off, such ligatures or sutures may often be caught and fished out by means of an instrument acting on the principle of a crochet-needle, or by means of a very small dull curette. Should these fail and the discharge continue for a number of months, the indication is to cut down and remove the offending cause. The operation is usually simple and relatively safe. An incision through the abdominal wall in the track of the original wound commonly enables the operator to dilate the deeper part of the sinus and seize the ligature; if not, the adherent viscera may be carefully separated until the nidus is reached and removed.

Long-continued suppuration is a reproach to the surgeon; it is annoying, irritating, and, even though slight, tends to produce degeneration of the kidney and other important organs; hence the importance of efficient methods for the prevention of it or for removal of the offending source.

Prevention. The use of absorbable catgut sutures and ligatures, which, if prepared by the formaldehyde or dry-heat process, may be absolutely sterilized—see Chapter II.—is a most satisfactory pre-

ventive. Silk, silkworm-gut, metallic, and other non-absorbable sutures and ligatures are, for the reasons indicated, not generally used in peritoneal surgery.

Fecal Fistula. The bowel during an operation may be opened, or so injured that an opening is liable to occur later. In either event the injury should be repaired before closing the abdomen. In a small proportion of such cases the sutures fail, or the bowel opens at some unsuspected point. The result usually is local infection, as already described, followed by a fecal fistula with discharge of the bowel-contents through a sinus in the wound.

The fistula, in a majority of cases, if left a few days, weeks, or months, will close spontaneously. Closure is usually more prompt in sinuses through the vaginal than through the abdominal wound. The explanation of this may be that the sinus is shorter and the vaginal wound less accessible, and therefore less tampered with. If the fistula does not finally heal, an operation for its closure may be necessary.

Urinary fistula follows the same general laws as fecal fistula. The former seldom occurs except where the bladder has been accidentally opened in the operation and the sutures for its closure have failed. The presence of the fistula is recognized by the appearance of urine through a sinus opening through the wound. The treatment is to introduce a self-retaining catheter and keep it in the urethra until the fistula closes. Secondary sutures are seldom required.

Stitch-abscess. Suppuration in the abdominal wound may usually be avoided by scrupulous asepsis. If it occurs, the sutures, unless buried, should be removed, and a wet dressing applied. The dressing may be of gauze, wet with a saturated solution of boric acid. Complete healing usually follows in a few weeks. In aggravated cases the abscess may have to be opened and drained.

Removal of Sutures. One may carelessly cut the loop on both sides of the knot; in such a case the ends of the loop retract below the surface and cannot be reached. If the loop does not become encysted, there may be suppuration around it, which will persist until it works out, is fished out with a crochet-needle, or an incision is made for its removal.

Ventral Hernia. The chief causes of ventral hernia are the drainage-tube — see Drainage — improper closure of the wound, and want of proper support to the abdomen by elastic bandages during the few months after the operation. The longer the incision the greater the need of the bandage; incisions not more than two inches long seldom require it. The treatment is to reopen the abdomen through or near the old cicatrix, split the sheaths of the recti muscles, and reunite the wound as already directed for ordinary closure of an abdominal wound.

CHAPTER IX.

THE RELATIONS OF DRESS TO THE DISEASES OF WOMEN.[1]

MANNER of living, environment, food, sleep, work, rest, recreation, exercise, and clothing must necessarily have a determinate influence on the prophylaxis and cure of disease. The gynecologist, therefore, who gives to this subject its true weight will stand upon a decided vantage-ground over that one whose resources are limited to drugs, local treatment, and operative measures. One of the most serious of all obstacles to the prevention and cure of the diseases of women is fashion in dress.

So long as sensible dress appears eccentric and excites ridicule women will adhere to the prevailing modes, and will therefore be hampered not only in the pursuit of recreation and exercise, but also in the performance of the more essential physiological functions. Under such conditions fashion must continue to prevail against strong nerves, powerful muscles, and robust health. As soon as the girl passes from the nursery to the drawing-room, and the dress of childhood is changed for the conventional dress of fashion, some of the evils of what we call civilization become manifest. She can neither walk, run, nor even breathe without embarrassment. The fact that woman has endured and survived the tyranny of dress for centuries without more serious results, says Emmet, is convincing proof of her power of endurance.

The prevention and cure of the diseases peculiar to women require the fulfilment of three principal conditions in dress:

1. Even distribution for uniform protection against cold and wet.
2. Freedom from waist constriction.
3. Freedom from traction.

1. Even Distribution. Uneven distribution is conspicuous in the prevailing modes of dress. The undergarments are usually of cotton or other light material and are often sleeveless and low in the neck. A profusion of skirts hang loosely about the lower extremities and give them relatively little protection. The outer garments are usually of thin material, and, according to the caprice of fashion, may or may not cover the arms, neck, and upper part of the bust. The bonnet is useless for protection. The feet are often held in the vice-like grasp of thin, high-heeled coverings which more resemble stilts than shoes. They expose the woman to great danger from cold and prevent free exercise. In contrast with such inadequate protection for the upper and lower extremities, the waist and hips are swathed and compressed

[1] The writer, in this presentation of the subject, has adapted freely from the works of Robert L. Dickinson, of Brooklyn, and J. H. Kellogg, of Battle Creek.

in a "torrid zone" of whalebone, corsets, belts, steels, skirts, and other cumbersome material.

2. Waist Constriction comes chiefly from the corset, which not only constricts the waist, but dislocates the thoracic viscera upward and the abdominal viscera downward. It restrains the abdominal and dorsal muscles, and may cause them to atrophy from disuse. It prevents, by its stiffness, the undulatory movements of the abdominal walls and restricts peristalsis.

FIGURE 101.

FIGURE 102.

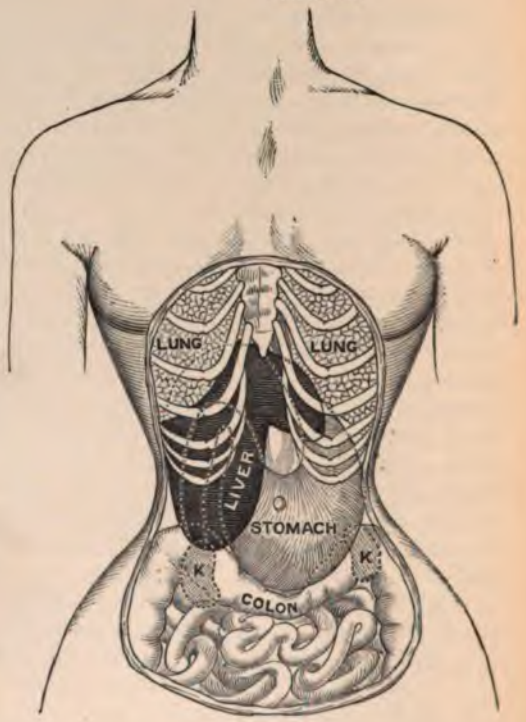


Figure 101.—Girl in corset and without corset. An exact reproduction from a composite photograph. Note the two outlines at the waist.[1]

Figure 102.—A corset-deformed figure, showing the displacement of stomach, liver, colon, and kidneys.[2]

Normal breathing requires the lungs to be expanded in all directions, and is therefore not costal nor abdominal, but a combination of both. Waist constriction immobilizes the abdomen, and thereby prevents abdominal breathing. This involves a loss in lung-power which cannot be supplied by any compensatory increase in costal breathing. Moreover, the diaphragm, from upward pressure, and the pelvic floor, from downward pressure, are rendered inactive and atrophic, and are thereby unable to make their upward and downward movements which

[1] Dickinson. Hare's System of Practical Therapeutics. [2] After Kellogg.

normally should be transmitted to the abdominal and pelvic viscera. The physiological importance of these respiratory movements is very great. They are a sort of natural massage. The descent of the diaphragm with each inspiration increases pressure in the abdominal cavity and lessens that in the chest. The reverse of this occurs with expiration.

Alternating pressure and relaxation upon the blood- and lymph-vessels secure free circulation. Alternating contraction and relaxation

FIGURE 103.

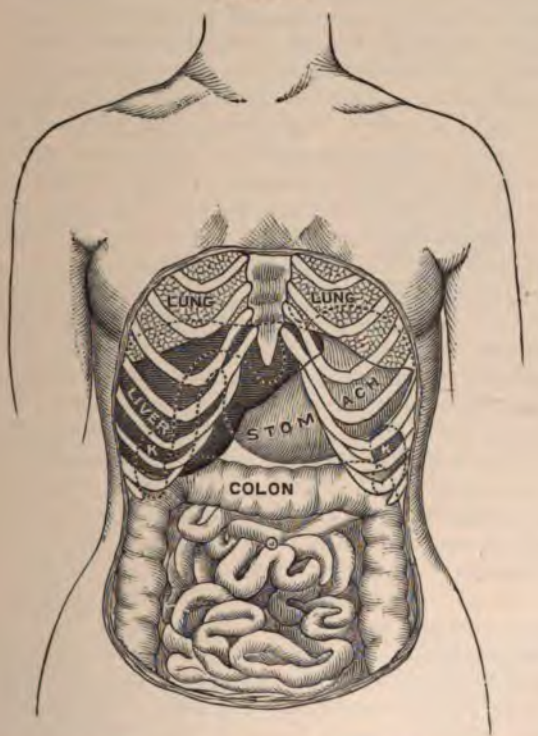


Diagram of a normal figure, showing the internal organs in their normal positions.[1]

of the muscular bundles of the uterine ligaments and of the other elastic and muscular parts of the pelvic floor serve to maintain their normal nutrition and tone. Alternating rest and motion are essential to the health of the organs and their supports; waist constriction immobilizes them and stops their physiological movements. The pelvic veins empty into the greatest area of corset pressure; the long and perpendicular column of blood of this area is by such pressure dammed back upon the pelvic organs, especially upon the ovaries. The consequence is passive congestion, an unfailing source of disease. Even the loosely worn corset excites great downward pressure when-

[1] After Kellogg.

ever the woman stoops forward, as she must do in sitting and rising. Sewing-women, clerks, writers, and students, who wear corsets, are especially subject to this evil.[1]

The garter is injurious from its tendency to obstruct the venous circulation in the legs.

3. Freedom from Traction. The abdominal and dorsal muscles and the hips have to carry the weight of numerous skirts and such other garments as usually oppress that area. In the effort to sustain this weight the muscles become permanently tired, lose their tonicity, and are powerless to prevent a still further increase of downward pressure upon the pelvic floor and pelvic organs.

Figures 102 and 103 are given to illustrate some of the evils of undue pressure and uneven traction.

To compare ordinary modes of dress with those which give freedom of motion, "one has only to look at a lot of girls on the way to the gymnasium," said a Vassar teacher. "They drag along; they have no spirit nor spring in them; they are in their ordinary clothes. Look at the same set coming on to the gymnasium floor in their light toggery; they skip and dance and run in the liberty of their unrestrained and untrammelled motion; they are different beings."

In laying aside waist constriction avoid half-way measures, such as loosening the corset or substituting the so-called health-waist, which too often is only an aggravated form of corset. Leaving off the corset altogether and retaining the numerous skirts with their bands and belts to drag upon the waist and hips rather increase than lessen the evil. The only judicious compromise is temporary support by means of a suitable waist having little or no stiffness, which shall cover the shoulders, and upon which skirts, drawers, and other garments may be buttoned, so that their weight may be distributed over the shoulders. This should be worn, if at all, only during the period of aggravated weakness, especially weakness of the back, which follows the withdrawal of the corset and continues until the weakened abdominal muscles have regained their tone.

The conventional dress consists of four garments hanging from the shoulders and five from the waist, namely, undershirt, chemise, corset-cover, dress waist, underdrawers, white drawers, corset, flannel skirt, dress skirt. Counting each band as two thicknesses, these make seventeen layers about the waist; and allowing twenty-five inches as waist circumference, these seventeen layers if joined end to end would make a bandage thirty-four feet long. Figure 105.

Hygienic dress requires four garments, namely:

1. Union undergarment.
2. Equestrienne tights.
3. Muslin waist and skirt.
4. Dress in one piece, or so made that its principal weight may be distributed over the shoulders, bust, and hips. This makes four layers about the waist. Figure 106.

1. The union undergarment is a union of the undershirt and

[1] Adapted from R. L. Dickinson. Hare's System of Practical Therapeutics, vol. iii. pp. 732, 733.

drawers in one piece; the open stride is supplied with the broad flap, as a protection to the external genitalia and to guard the other garments from their secretions. The material of the suit may be silk, wool, or cotton, or any mixture of these. In winter it should be heavy, with high neck and long sleeves, and should reach to the ankle. In summer it may be lighter, with lower neck and short sleeves, and should reach to the knee.

FIGURE 104.

Forward bending. Corset steels forcing the pelvic organs downward.[1]

2. The equestrienne tights are the substitute for the heavy woollen petticoat, and are designed for out-door use in winter. They reach from waist to ankle, corresponding to the man's trousers.

3. The muslin skirt and waist are often made in one piece, but there are practical advantages in making them separate. The waist, if separate, should reach well down over the hips, and the skirt, made without band, should be buttoned to it. The open stride of woman's garments is a patent source of infection, since, in conjunction with the dust-sweeping skirts, it exposes the external genitals to the entrance of dust and other fine particles, which are always irritating and often the vehicle of infectious bacteria. Closed muslin drawers are therefore desirable as a means of protection, and these also may be buttoned to the waist.

4. The dress may be in one piece, after the "princess" pattern; or,

FIGURE 105.

Layers of material about waist in old style of dress.[2]

FIGURE 106

Layers of material about waist in new style of dress.[2]

if in two pieces, the skirt, unless too heavy, may be attached to the waist with hooks, in which case its lining may be continued over the shoulders in the form of a carefully fitted skeleton waist.

The garments just described may be modified in many ways to suit individual requirements and tastes, but the essential principle must be observed, viz.: uniform distribution, freedom from undue weight and traction, and freedom from constriction. Light whalebones may be

[1] Steele-Adams. "Beauty of Form and Grace of Vesture."
[2] After Dickinson. Hare's System of Practical Therapeutics.

useful in the waist-seams for very stout women with pendulous breasts. Proper dress and consequent freedom of motion will stimulate the woman to outdoor exercise and indoor gymnastics, which, if followed with system and perseverance, will usually give normal tone to the abdominal and thoracic muscles and normal firmness to the breasts. Artificial support therefore, except in aggravated cases, is to be discouraged.

FIGURE 107.

FIGURE 108.

Figures 103 and 104 are not imaginary. They are faithful representations of a stout woman who changed the conventional dress and a sluggish life for proper dress and normal conditions of food, breathing, and exercise. The transformation was wrought in a few months.[1]

Union undergarments of all grades and descriptions, adapted to the needs and circumstances of all classes, may now be found in the shops. Economy, health, comfort, and, to the properly educated sense, beauty, all combine on the side of proper dress. It is marvellous that the monstrosities of fashion have so completely overshadowed the natural beauty of form and figure. From the standpoint of beauty shall we choose the natural lines of the body or the artificial lines of the corset, the garment fitted to the woman or the woman fitted to the garment?

[1] Modified from Steele-Adams.

Imagine the attempt to add to the dignity of the lion or to the beauty and grace of the greyhound by the use of artificial means to change the natural lines of their bodies. Throwing aside the all-controlling bias of fashion, who shall say that the woman is so inferior to the lower animals in form and figure that she must be taken-in in some places and let out in others? In this connection the words of Herbert Spencer have peculiar force: "Nature is made better by no mean, but Nature makes that mean; over that art which you say adds to Nature, is an art that nature makes."[1]

[1] Herbert Spencer. First Principles of Philosophy.

PART II.

INFECTIONS, INFLAMMATIONS, AND ALLIED DISORDERS.

CHAPTER X.

GENERAL CONSIDERATIONS OF INFECTION AND INFLAMMATION OF THE REPRODUCTIVE ORGANS.

INFECTION of any one of the reproductive organs is liable to have the closest relations to similar infection of a part or all of the others; for this reason an intelligent consideration and satisfactory explanation of the morbid process in any one organ may necessitate a study of infection in the pelvic organs as a whole. The distinction between infection and inflammation is of the greatest practical importance.

Definition of Infection.

Infection is that condition in which foreign media of irritation have gained access to an organ, and either mechanically or by means of their products, disturbed its functions. These media are capable of being transmitted to other organs and other individuals. In most cases, at least, the invading irritant, if known, is of bacterial origin. The organisms, unless arrested, are prone to multiply rapidly, to spread into new territory, to transmit themselves and their toxic products to the general circulation, and to destroy or seriously endanger the life of the patient.

Definition of Inflammation.

The local territory irritated by the organisms and their toxins beomes a centre to which leucocytes in variable numbers rapidly migrate, and in this way the process often called sero-plastic infiltration is established. By this infiltration a limiting wall is formed around the infected space. This wall confines the infective process to narrow limits, and may protect the general system against the poison. The formation of the limiting wall gives rise to heat, redness, pain, and swelling: *this is inflammation.* In view of these facts, inflammation is not really the disease, but an effort to limit the disease. The almost universal use of the word inflammation to signify the disease makes it difficult in the description of the morbid processes to conform to the ideas above expressed. The attempt will,

however, be made to use the two words infection and inflammation in their proper relations.

Etiology of Infection and Inflammation.

It is important to remember that the study of a morbid process in an organ or group of organs is simply the study of their anatomy and physiology as modified by that process. The inflammatory process has been defined as the reaction which living tissue exhibits to morbid irritation. This definition being correct, two conditions must be essential for the development of infection and inflammation:

1. The soil must be prepared and ready to react to the morbid irritation. Clearly, tissue which has the power to resist the irritation and to hold it within physiological bounds will not inflame.

2. The irritating influence must be present.

These conditions divide themselves into predisposing and exciting causes. The predisposing causes may be systemic or local.

The Systemic Predisposing Causes include whatever tends to render the system less resistant to morbid influences. The so-called diatheses fall under this head: anæmia, diabetes, rheumatism, gout, lithæmia, and cholæmia are examples.

The Local Predisposing Causes comprise whatever contributes to make the organs an accessible and receptive soil for infection. They are obvious in the following anatomical and physiological conditions:

The genital tract, from the vulva to the peritoneum, is an open canal, patent to the atmosphere below and terminating above in the free open ends of the Fallopian tubes. It is not only open to such microbic germs as abound in the air and penetrate everywhere, but is also a place of deposit for virulent bacteria.

The rupture of the capillary vessels of the endometrium in menstruation and of the Graafian follicles in ovulation, although physiological, results in solutions of continuity and in hemorrhage, and is therefore traumatic. These traumatisms and the menstrual engorgement of the pelvic organs under healthy conditions pass by with little or no discomfort; but if some morbid irritation upset the normal balance of nutrition, the menstrual congestion may become pathological and may be the first stage of an inflammation. The morbid congestion may be set up in the intermenstrual period independently of the menstrual congestion. The liability to inflammation is, however, greater during the menstrual week.

In addition to the physiological traumatisms already mentioned, the traumatisms of parturition, of abortion, of improper local treatment, and of operations still further open the way for the entrance of infection. Violent coitus, masturbation, the careless use of the unclean catheter, impure water in bathing, and soiled linen in the toilet are some of the means by which gonorrhœal, syphilitic, and other infections may develop in the genital tract.

The conditions of utero-gestation, parturition, and the puerperium are more perilous; hence infection of the puerperal woman is more destructive. Decomposed secretions and the products of fatty degen-

eration from involution and from the menopause favor the development of pathogenic microbes. Tumors, displacements, tight lacing, and constipation are among the common local predisposing causes of morbid congestion in the pelvis. Clearly the predisposing causes already outlined supply the first condition of infection—preparation of the soil.

The Exciting Causes comprise agents that have the power to produce and to maintain morbid irritation. Greatly preponderating, at least among these, are the pathogenic microbes and their products. The extent to which inflammation may be produced by irritants of non-bacterial origin without the presence of any bacteria whatever is a question not fully settled. Among the pathogenic microbes not seldom found in the genitalia are the staphylococci and streptococci of suppuration, the bacillus tuberculosis, the bacillus coli communis, and the pneumococcus of Fränkel. Bladder parasites and the saprophytes from the rectum and colon have easy access. See Chapter II., on Antiseptics and Asepsis. The bacillus coli communis lives in acid media, and can thus easily pass through the acid secretion of the vagina to the uterus.

GONORRHŒA.

The gonococcus of Neisser, one of the most frequent, destructive, and insidious factors in genito-urinary infection, is elsewhere partially discussed in connection with Vulvo-vaginitis, Salpingitis, and Acute Metritis; its chief power for harm lies in the lasting vitality of the germ long after apparent cure. The gonococcus may remain inactive in the mucous crypts, liable at any time, even while quiescent in the individual, to be communicated to another. Hence many an innocent and previously healthy woman, shortly after marriage to a man who supposed himself to have been cured of gonorrhœa years before, may by contact with the attenuated virus get a destructive gonorrhœal infection of the genito-urinary organs.

Some most important observations upon this subject have been made by Wertheim. He reports that human serum agar is the best culture-ground for gonococci. In this culture at 40°–43° C. they retain their full reproductive capacity. A direct experiment from pure culture from a gleety discharge of two years' standing gave the following interesting results: 1. Attempted reinfection of the original urethra with this culture was always a failure. 2. The culture when transplanted to a coccus-free urethra produced typical acute gonorrhœa. 3. Infection from this back again to the original urethra gave a fresh gonorrhœa, which after a typical acute course of five or six weeks again subsided into a chronic gleet. Thus, by passing the gonococci through another individual—that is, through a new culture-ground—they became again virulent to the urethra which was invulnerable to them before.

This explains the fact that an apparently healthy subject of chronic gonorrhœa may infect his hitherto uninfected wife and become again infected from her—*i. e.*, the gonococci by passing through the new culture of the wife again become virulent for the husband. In due time each becomes tolerant of the germ; which, however, may develop acute infection in another person. The common notion that gonor-

rhœa in women may be chronic from the beginning is weakened by the experiments of Wertheim. We can now understand why the gonococcus, even after years of apparent cure, may regain its full virulence.

The greatest danger is of extension to the Fallopian tubes; this will be further considered in the chapter on Salpingitis. The microbe may be found in the uterus and tubes long after it has disappeared from the vagina. The pavement epithelium of the vagina and the presence of the lactic-acid bacteria normally found there by Döderlein, page 165, make the vagina relatively immune. The crypts of the uterine and tubal mucosa furnish a ready resting-place for the germ.[1] Even here, in many cases, it is only found during the exacerbations. Menstruation favors, but does not insure its revival. It may for long periods remain concealed in a semi-quiescent state, a destroyer of health, a menace to life. The frequency of chronic gonorrhœa—the latent gonorrhœa of Noeggerath[2]—has been variously estimated. There are reasons to fear, however, that the percentage is very high. Sänger[3] announces that 25 per cent. of his hospital and private patients have gonorrhœa. Lomer[4] found the diplococcus in fully 60 per cent. of the cases in Schröder's clinic. One observer places the average as high as 80 per cent.

The statistics quoted above are taken from clinics largely made up of prostitutes and semi-prostitutes, a fact which will necessarily modify a judicial estimate of their value. It is, moreover, essential to appreciate two other facts: first, the evidence on this most complicated question, although sufficient to lead to the greatest apprehension, is not yet sufficient to establish definite and undeniable proof on the extreme side of the question; second, many excellent clinical observers in private practice are disposed, on the whole, to qualify the danger and to conclude that it is vastly overestimated. If the questions involved were matters only of scientific interest, their solution would properly wait for further and more exact observation; but the "danger and duty of the hour" are concerned with moral, not scientific, problems, and the moral obligations are serious enough to lead the writer to present the subject even from the *ex parte* standpoint.

Why do large numbers of apparently healthy young women date their pelvic infection from the marriage-week? Is it, as one author declares, the "fatigue and excitement of the wedding-journey?" Why do so many women with perfectly developed reproductive organs remain sterile from the time of marriage or after the birth of a single child and a dangerous "childbed fever"? The causation of too many of such cases of hopelessly diseased uteri, tubes, and ovaries, not to mention proctitis, with sometimes rectal stricture, urethritis, cystitis, pyelitis, and nephritis, has been explained by the word idiopathic. The histories, if written, would often tell of an apparently cured gonorrhœa, before or after marriage, in the husband. If the most destructive infection may follow contact with a subject of gonorrhœa after the discharge has ceased, how perilous must be the slight gleety

[1] Steinschneider. Berliner klinischer Wochenschrift, 1887, No. 17. From Pozzi.
[2] Noeggerath. Latent Gonorrhœa. Trans. Amer. Gyn. Society, vol. i. p. 268, 1876.
[3] Sänger. Ueber die Beziehung der Gonörrhoischen zu Infektion zu Puerperal Krankungen. Verhandlungen der Deutschen Gesellschaft für Gynäkologie. Leipzig, 1896.
[4] Lomer. Deutsche medicinischer Wochenschrift, 1885, No. 43.

discharge so often disregarded! Young men are sometimes advised to marry in order to improve their sexual hygiene, and so to cure an intractable chronic but "innocent gleet." Such advice may result in the destruction of the reproductive organs of an innocent woman. It is doubtless possible, perhaps not unusual, for gonorrhœa to be so cured that the individual cannot transmit the disease. Failure, however, to cultivate the gonococcus from the urethral secretions does not prove its absence. So long as it can be cultivated marriage should be prohibited. In every suspected case marriage should be deferred at least until repeated attempts at culture have failed. A gonorrhœal record does not necessarily settle, but it always complicates the question whether the individual may safely marry.

Pathology and Course of Infection and Inflammation.

Bacterial invasion and consequent infection may spread and involve any or all of the genito-urinary organs by either or both of two routes:

1. By continuity of mucosa.
2. By the lymphatics or bloodvessels.

Infection by Continuity of Mucosa. The course is usually upward from the vulva or vagina, through the uterus and Fallopian tubes to the ovaries and peritoneum, or through the urethra, vagina, bladder, and ureters to the kidneys. The numerous glands of the vulva are strongholds where the virus may intrench itself and whence the constant supply may find its way to the organs above.

The vagina, advantageously covered with pavement epithelium, is relatively smooth, like skin, and is supplied with an acid secretion. Bacteria, accordingly, find lodgement there less easily than in the vulva. Moreover, the acid medium unfavorable to the growth of about 90 per cent. of all pathogenic microbes makes the vagina a difficult barrier to pass.

The uterus, although protected by these anatomical and physiological conditions of the vagina, is itself especially vulnerable on account of the loose arrangement and thinness of the epithelial covering, the villous network of the arbor vitæ of the cervix, the confluence and ramifications of the glands, and the richness of the periglandular and perivascular network. By reason of these conditions the cervix uteri is adapted to receive, retain, and distribute infection. Were it not for the muscular constriction at the external and internal ora and the utero-tubal constrictions the frequency of infection of the endometrium would be much greater.[1]

The Fallopian tubes are embryologically and anatomically continuous with the uterus; they are, in fact, a part of it, and subject to the same causes of infection. The ovaries and pelvic peritoneum, in direct communication with the tubes, may receive infection from below. Infection by continuity of mucosa, however, although usually from below, does not always come from that direction; it may reach the ovaries and pelvic peritoneum from above, and descend through the

[1] Bonnet and Petit. Traité Pratique de Gynécologie.

tubes, uterus, and vagina to the vulva. Tubercular infection, for example, usually goes in this direction.

Infection by the Lymphatics and Bloodvessels is undeniable in puerperal women. The traumatism of parturition, often very extensive all the way from the uterus to the vulva, may open wide the door for infection to be transmitted by the vessels. The destructive influence of the inflammation—*i. e.*, phlebitis and lymphangitis—on the vessels themselves may seriously and permanently impair the nutrition of all the pelvic organs.

It has been commonly accepted belief that, save in puerperal cases, infection travels by continuity of mucosa, but the route by the lymph and bloodvessels has often been denied. It is clear, however, that if infection is, as is proved by the bubo, often transmitted by way of the lymph vessels to the inguinal glands, it may also travel by way of the lymph vessels a much shorter distance, from the vagina or cervix to the parametria, perimetria, and Fallopian tubes. This reasoning by analogy has been verified by experiment. Some observers, notably Lucas-Championnière,[1] maintain that this is the more common mode of infection. Wertheim, from experimental investigation on white mice, rabbits, dogs, and guinea-pigs concludes that gonococcus infection can pass through pavement epithelium and connective tissue so as to reach the lymphatic and vascular channels, and be carried by them from the vagina or cervix to the ovaries, tubes, and peritoneum, producing thus ovaritis, salpingitis, and peritonitis. Giglio[2] also experimentally demonstrated that infection may travel from the vagina, cervix, and bladder to the broad ligaments and may produce extra-tubal pelvic abscess. He maintains that infection by the vessels is more frequent than by continuity of surface. When the latter occurs he asserts that it is more commonly in the descending order from the tubes to the uterus. This statement of Giglio may have to be revised.

Continuous infection does not always mark the course of the microbes through the vessels. The microbes colonize at the points of least resistance; hence the tubes may suppurate and the ligaments and ovaries go free. When, however, the microbes travel by way of the mucosa a continuous inflammation is usual, though not invariable.

Infection by the veins is specially common in puerperal cases. It has often produced general septicæmia and pyæmia through very slight lesions. The arteries also may carry infection. This is proved by the fact that bacteria have been found in places where they must have been carried by the centrifugal circulation; for example, the gonococcus in the knee-joint.[3] Hetero-infection of the genitalia—*i. e.*, infection from without—is not the invariable rule. Diseased organs may send their germs by way of the lymphatics or bloodvessels, and produce secondary infection of the pelvic peritoneum, ovaries, tubes, and other genitalia. Tubercular infection of the tubes, secondary to that of the lungs, is a familiar example.

[1] Paris Surgical Society Transactions, December, 1888. New York Medical Journal, March 22, 1890.
[2] Giglio. Annalio di Obstetricia e Ginecologia, May and June, 1893.
[3] Luther. Sammlung klinische Vorträge, 1893.

Experiment and clinical observation also show that both puerperal and non-puerperal infection may travel by bloodvessels, by lymph-channels, and by continuity of surface. The relative frequency, however, of these modes of transmission is a matter of speculation. Probably the route by continuity of surface is really a superficial lymph-route—that is, the infection may travel along the lymph-channels of the mucosa.

Classification of Infection and Inflammation.

Let us now raise a question relative to the looseness and confusion of the current classifications. The term simple infection as distinguished from septic, for example, has no strict pathological meaning. It is not yet settled whether the so-called simple infection is aseptic or whether it is only slightly septic. We know that an infection seemingly very mild may readily take on a decidedly virulent character. We may think of the infective or inflammatory process in several ways: 1. As having gone only into the congestive stage; this would be a mild form. 2. As having gone on to the stage of effusion or suppuration. 3. As being the result of a mild or more virulent infection. 4. As occurring in structures of greater or less resistance. What is there in such conditions to designate on the one hand as simple, on the other as septic? In the present state of our knowledge we must use for descriptive purposes an adaptable, and therefore flexible, nomenclature. In this nomenclature words like simple and septic can have only a loose clinical significance. They cannot be utilized as the outcome of scientific classification. We may simplify the subject by throwing out such a word as simple.

A distinction between acute and chronic inflammation, since these conditions enter extensively into the pathology of the diseases of women, is most important. Many deny altogether the existence, for example, of chronic inflammation of the endometrium. Some attribute the condition which is usually classed under that name to congestion; others call it a subinflammatory state. It may be well to remark that an essential factor of inflammation—round-cell infiltration—is found in those chronic conditions, and that they may therefore be properly classed as inflammatory; this migration of white corpuscles however, occurs more slowly, and may in some cases be very slight. In this respect the difference between acute and chronic inflammation is one of degree. We shall avoid the question whether certain conditions should be called congestive, inflammatory, or subinflammatory. The discussion of this question is tiresome and unprofitable—a contest largely of words. The following outline of some of the phenomena of inflammation will help make clear the distinction between acute inflammation and the conditions which are usually grouped under the name chronic inflammation.

The inflammatory reaction which living tissue exhibits to morbid irritation is first defensive, and then constructive or reparative. The defensive process is an effort to circumscribe the disease by throwing around it a limited wall of exudate; the morbid force thus confined and concentrated within narrow limits is within these limits more or

less intense and destructive. It may result in the sacrifice of a part for the safety of the whole. The force of the disease is spent in the destructive process, and may be active only or chiefly within the limiting wall. Finally, normal conditions of nutrition are re-established, the constructive or reparative process becomes active, and the limiting wall is absorbed. If the constructive process continues until repair is complete and then ceases, the part will resume its normal functions—the inflammation will be at an end.

Acute Inflammation. If the infection is of such virulence or otherwise of such character as to call forth the defensive processes just described, and to produce blood-stasis with more or less severe swelling, pain, heat, and redness, and finally to produce local destruction, the inflammation is acute. The disease may terminate with resolution or go on to suppuration.

Chronic Inflammation. If the irritation is of minor intensity, or in any other way of such character as to fall short of provoking much defensive action, there will be little or no limiting wall, and consequently no intense destructive process concentrated within a circumscribed space; heat, swelling, pain, and redness, if present, will be more diffuse and less pronounced. Chronic inflammation occurs under these conditions—a minimum of defence and an excess of construction.

Chronic inflammation may follow acute infection, or may have been subacute or chronic in the beginning. The excessive constructive action which belongs to it explains the hyperplastic and hypertrophic results of so-called chronic metritis. It also explains certain morbid nutritive changes in the blood and lymph vessels of the pelvis and in the cellular tissue of the pelvis. Sclerotic changes in other organs, such as arterial sclerosis and interstitial nephritis, offer a close analogy.

It is unprofitable to speculate on the question whether the conditions just described under the name chronic inflammation may better be classified as congestive or as subinflammatory states. They are recognizable under either of these names. They occur more frequently in neuropathic women, and especially in cases of the various diatheses—anæmia, lithæmia, gout, cholæmia. Diabetes also is a strong predisposing cause. They are usually less dangerous to life and often more destructive to health than the acute inflammations. They constitute a large proportion of the ailments of women and include some of the most distressing ailments. They are persistent and hard, often impossible, to cure. In such cases it is frequently difficult to draw the lines between those congestions which fall short of inflammation and actual inflammation. One of the most common forms of so-called uterine catarrh is that which occurs in women of *deficient eliminative power*—that is, the bowels, kidneys, and other eliminative organs fail sufficiently to throw off the waste-products. Under these conditions the mucous glands of the uterus, for example, whose function is not excretory, may vicariously undertake to make good the deficiency. An unspeakable amount of *misdirected* and *injurious* local treatment is constantly being applied to the endometrium in such cases.

The significance of pelvic infection varies according to the resistance of the patient, to the location and nature of the structures involved, and to the virulence of the causes which produced it. Strong predisposing causes make the woman less able to resist morbid irritation; and infection once established is more likely to be severe and progressive. If infection is confined to superficial areas, its gravity is relatively much less than when deeper structures are diseased. Endometritis, for example, is less serious than an inflammation involving the uterine wall or the parametric lymphatics and veins. Moreover, the same kind of infection may be more serious in some places than in others. This may be illustrated by the case of a man who picked his teeth with a vaccine point and experienced a most distressing result. Some bacteria are harmless and some only mildly virulent. The gonococcus, for example, is more general, and therefore more disabling than the staphylococcus. The streptococcus pyogenes is more dangerous than either.

From the foregoing it is easy to explain why an infection, even in the deeper structures, may, if not from very destructive bacteria, present in the more acute stages most of the subjective and some of the objective appearances of a fatal disease, and yet after a few days terminate in a return to complete health. The reason is also obvious why a superficial vulvar infection, apparently innocent, may be the result of a gonococcus or of a streptococcus invasion, and may by continuity of surface, or by way of the lymphatics or veins, finally destroy life or render it miserable and useless. Some organisms may excite little or no defence—*i. e.*, may not attract leucocytes—and may therefore sweep through the system with rapidly destructive and fatal force. This would be infection without defensive inflammation. The germ of tetanus is an example.

Diagnosis, Prognosis, and Treatment of Infection and Inflammation.

The symptoms are often utterly disproportionate to the lesions. An infection of little danger may cause the greatest suffering; another, which directly threatens life, may be almost painless. Objective examination should, therefore, especially in acute cases, be thorough. The subjective symptoms may be misleading. The prognosis depends upon the region infected, the general and local resistance of the patient, and the extent and nature of the infection.

The treatment requires the individualization of each case, and must therefore be referred to the special subjects.

CHAPTER XI.

VULVITIS, VULVO-VAGINITIS, VAGINITIS.

THE importance of vulvitis and vulvo-vaginitis is commonly underestimated. Inflammation seemingly trivial may start in the vulva and rapidly extend to all the reproductive and urinary organs, and may, therefore, give rise to metritis, salpingitis, ovaritis, peritonitis, urethritis, cystitis, pyelitis, and nephritis.

The external genitals are the labia majora and minora; the clitoris, with its prepuce; the vestibule, including the meatus urinarius; the fossa navicularis, and the hymen. The hymen separates the external genitals from the vagina. The covering of the external genitals is cutaneous, although it partakes somewhat of the nature of mucous membrane.

Definitions.

Vulvitis is inflammation of the external genitals.

Vaginitis is inflammation of the mucosa and submucosa of the vagina.

Vulvo-vaginitis is inflammation of the vulva and vagina.

Classification.

The inflammation, which may be acute or chronic, has been classified:

1. *Bacteriologically*, according to the nature of the bacterial cause which may have produced it.
2. *Anatomically*, according to the special structures involved.

Etiological Classification. The following inflammations are of bacterial origin. They may occur as vulvitis, as vaginitis, or as vulvo-vaginitis:

1. Gonorrhœal, caused by the gonococcus of Neisser.
2. Erysipelatous, caused by the streptococcus of erysipelas.
3. Diphtheritic, caused by the Klebs-Löffler bacillus.
4. Tuberculous, caused by the tubercular bacillus.
5. Mycotic, caused by the leptothrix and the oïdium albicans.
6. Syphilitic, caused by the bacillus of syphilis.

Other forms of vulvo-vaginal infection are caused often by other micro-organisms, chief among which are the staphylococcus, aureus, albus, and citreus, the streptococcus, and the unrecognized micro-organisms of infectious and contagious diseases. Pseudo-diphtheric vulvo-vaginitis is a form in which a false membrane is developed, but is not due to the bacillus of diphtheria.

Inasmuch as the specific micro-organism is seldom recognized at the bedside, the above classification is perhaps more important from a scientific than from a clinical point of view.

2. Anatomical Classification. Vulvar and vaginal inflammation may attack special structures, such as the skin, mucous membrane, cellular tissue, glands, and follicles. This is without reference to the particular nature of the micro-organisms which may have been the irritating cause of the infection—*i. e.*, the anatomical forms may come from bacteria of widely different natures; these forms are:

Superficial vulvo-vaginitis,	Follicular vulvitis,
Senile vulvo-vaginitis,	Furuncular vulvitis,
Glandular vulvitis,	Emphysematous vaginitis.
Paravaginitis,	

The classifications above outlined cannot from the clinical standpoint always be followed. An effort, however, to differentiate between the various forms should, for both clinical and scientific reasons, be attempted.

Eczema, kraurosis vulvæ, herpes vulvæ, and other allied disorders will be presented in the following chapters. Pruritus vulvæ and vaginismus, although often symptoms of vulvo-vaginal inflammation, are of neuropathic significance, and are therefore sometimes classed among the gynecological neuroses.

The general consideration of vulvar and vaginal inflammations includes certain factors in etiology, pathology, and diagnosis which are more or less common to all varieties. To avoid repetition and to give a general impression of the whole subject, these factors may be studied before taking up the special form.

General Consideration of Etiology.

Predisposing Causes. The predisposing and exciting causes of inflammation in general have been outlined in the preceding chapter on the Principles of Inflammation. Among the particular predisposing causes of vulvo-vaginal inflammation are the following:

Filth,	Vaginal fistulæ,
Obesity,	Excessive coitus,
The diatheses,	Masturbation,
Foreign bodies,	Irritating urine.

Among the foreign bodies are pessaries, etc., and under irritating urine may be mentioned diabetes.

Exciting Causes. Numerous bacteria, some of which have been already indicated in the etiological classification, are undoubtedly the essential causes of the various forms of vulvo-vaginal inflammation.

Vulvo-vaginal inflammation is occasionally, and especially in children, a sequel of such acute infectious diseases as diphtheria and scarlatina.

The Media of Infection may be:

Pathologic discharges from the uterus, Fallopian tubes, and vagina.

Pelvic abscesses discharging into the vagina.
Urine and feces.
Carcinomatous discharges.
Pediculi pubis.

The disease may, especially in cases of severe pruritus, come by extension from the anus ; very often the morbid irritation is furnished by organisms from the diseased bladder, ureters, or kidneys. Infection may originate in the vulva or from the surrounding cutaneous surface. It may result from direct infection or from an irritating discharge from some higher zone in the pelvis.

Filth outranks every other cause, with the possible exception of the gonococcus.

Epidemics and endemics of vulvitis have been recorded.

In fat women of sluggish capillary circulation the vulva is supersensitive to undue irritation. The excessive oily secretions undergo decomposition into fatty acids, which cause intense intractable erythema of the vulva, and often of the thighs and nates, a condition aggravated by filth—*i. e.*, by accumulated and decomposed secretions, especially in warm weather, when perspiration is free. Masturbation may be a cause or a result of the disease.

The determining factors of etiology, especially in chronic vulvovaginal infection, lie, first, in the predisposition of the patient ; second, in the nature of the infection ; third, in its location. Badly nourished, neuropathic, diathetic women are predisposed to chronic diseases. Some bacteria, notably the gonococci, are especially apt to produce intractable infection. The location, however, of the infection in the glandular elements is a principal factor in the chronicity of the disease. Colonies of bacteria become intrenched in the vulvar glands and follicles, from which fresh infections may travel upward to the vagina and uterus. Similar colonies may exist in the muciparous glands of the cervix, and from this point be distributed not only to the parametria, corpus uteri, tubes, peritoneum, cellular tissue, and ovaries, but also downward to the vagina and vulva. The vulva and the cervix uteri, especially the latter, are the two great distributing points of pelvic infection.

General Considerations of Pathology and Pathological Anatomy.

Catarrhal, suppurative, hemorrhagic, and ulcerative processes are rather phases than varieties of inflammation. The process is catarrhal when the product is a pathological increase of the normal secretion, suppurative when it contains pus, hemorrhagic when it contains an appreciable amount of blood—*i. e.*, when the destructive process has opened the walls of the vessels or produced diapedesis, and ulcerative when there is localized necrosis. The catarrhal often precedes the suppurative infection by a distinct period.

The skin or mucous membrane in chronic cases usually becomes thick and œdematous. The pyogenic microbe does not produce suppuration until the structures are in a degree impaired. A circumscribed suppurating surface may be surrounded by an area of catar-

rhal inflammation. The necrotic tendency may not go beyond erosion; it may merely impair without destroying the skin or mucosa, or it may extend far below the surface and form a deep ulcer. Vulvitis and vaginitis may exist separately or together.

So-called granular vulvo-vaginitis is due to swelling and hypertrophy of the vulvo-vaginal papillæ, is chiefly found in the vagina, and, though not confined to that period, is commonest during pregnancy. It is characterized by small, round, protuberant granulations scattered thickly over the affected surface.

The inflammation may result in extensive ulceration of the vulva or vagina, or of both. Sufficient plastic material may be thrown out to cause adhesions more or less firm between the nymphæ or the labia majora, or between the vaginal walls, or between the vagina and the cervix. Partial or complete closure of the vulva is not uncommon in children. Such adhesions usually yield readily to slight force. They resemble the adhesions often found between the prepuce and the glans penis of the male child. These adhesions may be between the clitoris and its prepuce, and may give rise to serious nervous disturbances. The surfaces may be so thoroughly united that they can only be separated by dissection. Strong adhesions are less likely to occur in married women than in virgins and aged women whose organs are at rest.

If gonorrhœa be excepted, suppuration is mostly confined to the vulvitis of children, especially children with defective nutrition. The purulent secretion of vulvitis or of vaginitis is creamy, abundant, and malodorous. Numerous minute points of superficial suppuration in a limited area may run together and form an ulcer. In this way many areas of ulceration may be formed. If ulcerative changes involve the small bloodvessels, the secretions will be streaked with blood. Severe cases may present hemorrhagic areas, great swelling, and even gangrene.

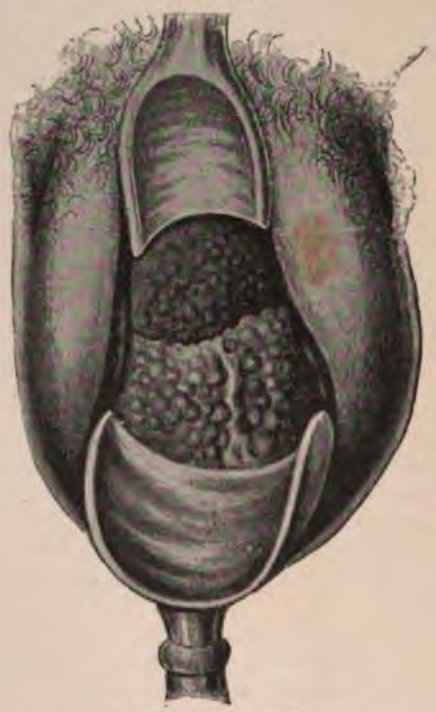
Extension of vulvar inflammation to the vagina is common, though not so common as it would be were it not for the following anatomical and physiological conditions of the vagina: it is smooth, and, being covered with pavement epithelium, closely resembles skin; is almost if not quite destitute of glands, and is therefore not subject to intense catarrhal affections.

Döderlein[1] has distinguished microscopically two secretions of the vagina: one the normal secretion, a whitish, milky, strongly acid discharge without mucous admixture; the other a pathological secretion, yellowish, faintly acid, often neutral or alkaline, sometimes foamy and mixed with mucus. In the normal secretion a non-pathogenic vaginal bacillus was found constantly present. Döderlein's experiments with cultures showed that this bacillus gives to the normal secretion its acid reaction, which is due to lactic acid. These normal vaginal bacilli were found to be unfavorable to the growth of the staphylococcus pyogenes aureus. In fact, the vast majority of pathogenic bacteria do not thrive in an acid medium. In the pathological secretion Döderlein found the pathogenic bacteria to be increased

[1] Döderlein. "Das Scheidensekret und Seine Bedeutung für das puerperal Fieber." Brochure, Leipzig, 1892, pp. 81. Centralblatt f. Gynäkologie, 1892, No. 11.

and the normal vaginal microbes to be decreased. The abnormal secretion usually originates in the cervix uteri, is toxic to animals, and by its hostility to the normal vaginal microbe decreases or neutralizes the acidity of the vaginal secretion, thereby affording a favorable culture-ground in the vagina for pathogenic bacteria. A lesson to be learned from these observations is the importance of stamping out

FIGURE 109.



Granular vaginitis.[1]

vulvar inflammation, and thereby preventing its invasion of the higher genitals, especially the cervix uteri.

When vaginitis occurs the desquamated cells of vaginal epithelium give rise to a thick, pasty accumulation of smegma not unlike vernix caseosa. When the epithelium is shed and the deeper structure exposed, pus is thrown off from the exposed surfaces.

Vulvo-vaginitis, if superficial, strongly tends to recovery. It becomes obstinate when the vulvar glands already described are involved, and may be intractable when it reaches the muciparous glands of the uterus. Reference is made to the remarks in the preceding chapter on the relative capacities of the vulva, vagina, and cervix to receive, retain, and distribute infection.

Chronic Vulvitis and Vaginitis may occur separately or together. Clinically, chronic vulvitis and vaginitis are more commonly observed

[1] From Heitzmann, in Thomas and Mundé's Diseases of Women.

than acute; they may follow the acute, or may have been chronic or subacute in the beginning.

General Considerations of Symptoms and Diagnosis.

The purpose of a diagnosis is not so much to give a name to the disease as to furnish a basis of rational treatment. A diagnosis should include, therefore, the source, variety, and complications of the disease. It would be absurd to confine the treatment to the area of inflammation if, for example, the disease were secondary to metritis, carcinoma, cystitis, or vaginal fistula. Attention to such complications as fissure in ano, hemorrhoids, rigid sphincter, threadworm and endometritis often gives relief. The diagnosis should have special reference to the possible extension of the disease into the ducts of the vulvar glands and urinary organs. The discharge from a pelvic abscess has been mistaken for the secretions of vulvo-vaginitis.

The symptom-group in *acute vulvo-vaginal inflammation* comprises irritation, pain, redness, swelling, and increased secretion. The systemic symptoms of inflammation are absent or slight, except in cases of extensive phlegmon or suppuration. The pain and swelling are often so intense that the patient must lie down with the thighs apart. Carcinomatous ichor causes irritation rather than pain. Frequent urination and dysuria are common. Urination is painful from contact of urine, especially when the infection has extended to the urethra and bladder.

The disease starts with local irritation, congestion, redness, swelling, pain, and heat. The labia minora sometimes swell to twice the size of the finger, and may consequently close the vulva; they have a bright, glistening appearance not unlike the inflamed swollen prepuce of the male. The pain is throbbing and extreme in proportion to the swelling. The inflamed surfaces, which may include both vulva and vagina, are at first dry, but soon become moist in consequence of an effort of the glands to relieve the congestion by increased secretion. The secretion, usually profuse, is a chief evidence of the disease. In children the disease, unless due to gonorrhœal infection, is usually confined to the vulva.

Chronic vulvar and vaginal inflammations are recognized by their persistency, by their tendency to recur when apparently cured—see Follicular and Glandular Vulvitis—and sometimes by the presence of erosion of the vulvar, vaginal, or vulvo-vaginal surfaces. They are characterized by a scanty, thin, yellow discharge, usually more or less purulent; by great local irritation; by variable redness; by slight swelling, and often by excessive granulation. The surfaces, especially the vulvar surfaces, finally become hard, œdematous, leathery, parchment-like, and painful. A principal symptom of chronic vulvar inflammation is an intolerable, often intractable, itching and burning.

General Considerations of Treatment.

The experiments of Döderlein—see page 173—would suggest vaginal douches of a 1 per cent. aqueous solution of lactic acid.

This would clearly not apply to infection from bacteria which grow in acid media.

The vulva is normally moist from its own secretions. Dust and dirt, which may contain irritants capable of exciting vulvitis, easily reach the vulva and find lodgement there. As a prophylaxis against this source of vulvitis, and as a better protection against sudden changes of temperature, the closed drawers should take the place of the commonly worn open drawers. The daily shower-bath applied to the external genitals is an excellent prophylaxis. Strong soap is irritating, and therefore injurious.

The Treatment of Acute Vulvitis is chiefly local, and includes two essentials, cleanliness and palliation. Mild alkaline solutions, such as sodium bicarbonate, when applied to the vulva, may combine with the oily secretion to form a soap which, upon being washed off with warm water, leaves the surface clean. Washing should be frequently repeated as a preparation for other applications, such as a lotion of equal parts of dilute solution of acetate of lead and fluid aqueous extract of opium, the 4 per cent. aqueous solution of antipyrine, the 4 per cent. solution of cocaine, the 4 per cent. ointment of morphine sulphate, the spray of an alkaline solution or of the 5 per cent. solution of carbolic acid. The warm sitz-bath or the ice-bag applied to the vulva is indicated in cases of extreme irritation and burning. Absolute rest in bed is important. A rectal suppository containing extract of opium, two grains, and extract of belladonna, one-fourth grain, may give relief and secure much-needed sleep. Avoid ointments containing animal fat. Vaseline, clear or stiffened with wax, is a good excipient. If the labia can be separated without too much pain, a light gauze or lint compress saturated with a soothing antiseptic solution may be placed between them. Buboes and other abscesses should be opened. Great care is needed to avoid carrying the infection from the vulva to the vagina or uterus by the syringe-tube or examining-finger.

The general treatment consists of remedies to allay irritation and reduce arterial tension. Small doses of aconite may be indicated. Free action of the bowels by salines is essential. Soporifics and anodynes are indicated for nervous irritation and pain.

The Treatment of Chronic Vulvitis includes, in addition to such of the above means as may be indicated, astringents and, in obstinate cases, caustics. The surfaces should be dressed with gauze compresses saturated with a 1 to 3000 aqueous solution of the bichloride of mercury, or a 3 per cent. aqueous solution of carbolic acid. If the disease has been caused by pediculi pubis or other parasites, mercurial ointment, in addition to the above solutions, should be used to destroy them.

The daily hot-water vaginal douche may be supplemented with a solution of copper sulphate or zinc sulphate, one drachm to the quart of water. Extensive erosion is often promptly cured by the free use of benzoated oxide of zinc ointment. The eroded surfaces, having been dried, may be daily dusted with calomel or with the subgallate of bismuth. In neuropathic cases of severe pruritus almost miraculous

relief sometimes follows the free withdrawal of blood from the uterus, either by scarification or by leeches.

Granular inflammation of the vagina may be cured by painting the granulated part with a 1 to 40 solution of nitrate of silver and daily packing the vagina with gauze. The treatment of vulvo-vaginal inflammation will often demand the removal of a causal endometritis. Obstinate cases often yield to frequent applications of 10 or 20 per cent. of ichthyolate of ammonium in glycerin. The application is best made with a compress secured by a bandage.

SPECIAL FORMS OF VULVO-VAGINAL INFLAMMATION.

The special forms of vulvo-vaginal inflammation will be considered separately in the following paragraphs.

Gonorrhœal Vulvo-vaginitis.

The gonococcus, one of the most active and most virulent elements in the diseases of women, has been found in all of the genito-urinary organs, and is the cause of a large proportion of the cases of destructive metritis, salpingitis, and ovaritis.

Gonorrhœa is always the result of gonococcus infection. The disease is characterized by a strong tendency to penetrate and spread, and is prone to attack the follicles and glandular structures of the vulva, especially the vulvo-vaginal glands and Skene's glands. Diffuse and deep cellular inflammation and abscess of the vulva may also result from gonococcus infection. See remarks on the gonococcus, and upon recurrent gonorrhœa in woman, page 155.

Gonorrhœa not uncommonly extends throughout the genito-urinary tract, although the constant downward current of urine may in a measure protect the more distant urinary organs. If the infection originates in the vulva, it usually extends to the vagina, and *vice versa*. The urethra seldom escapes. The inguinal glands may be infected by transmission of the infection through the lymphatics, and are especially prone to suppuration.

Children are more subject to this infection than is generally supposed. It may come from infected bed-linen, from bathing with infected cloths or sponges, or from the unclean hands of infected nurses. In children the disease is less liable than in adults to extend to the vagina, because the vagina is protected in a measure by the hymen. It may, however, be easily carried upward on the douche point.

The Bartholinian glands and Skene's glands at the meatus are commonly the primary seat of infection. The skin surface of the vulva and the vaginal mucosa, because of the protecting epithelium, seldom are infected primarily. In advanced years, when the epithelium of the vagina has desquamated and the tissues are of low vitality, primary gonorrhœal vaginitis is more likely to occur.

Diagnosis. A suspicious exposure, great pain, and unusual systemic disturbance should excite suspicion. Radiation of pain to the

rectum, perineum, and bladder, urethral burning, and involvement of the deeper glandular structures are diagnostic signs. The positive diagnosis depends upon finding the gonococcus by microscopic examination of the secretion.

Treatment. It is highly important to stamp out the gonorrhœal infection while it is yet in the vulva or vagina, and thereby to keep the infection from going to the higher zones of the genito-urinary system, where it is always destructive and often fatal. Disinfectants—*i. e.*, germicides to the extent of the patient's toleration—are indicated. Scrupulous cleanliness should be enforced and rigidly maintained.

Daily packing of the vagina loosely with tampons of sterile gauze or absorbent cotton saturated with an aqueous solution of formalin, 1 in 1000, will be useful during the active stage, and, if there is a tendency to ulceration, will be very effective. If the disease is in the vagina, quite intense, let the vulvo-vaginal surfaces be painted once or twice, as in granular vaginitis, with solution of nitrate of silver, forty grains to the ounce. The vagina and vulva should then be packed with dry sublimated or borated gauze, which should be renewed as often as it becomes moist from the secretions. At each time of changing the gauze the surfaces should thoroughly be cleansed by means of a warm 5 per cent. aqueous solution of carbolic acid; this is to be followed by a thorough washing with peroxide of hydrogen, which is very cleansing to the deeper glandular structures.

A solution of nitrate of silver may be used with excellent effect as follows: The patient being in the dorsal position, with the hips elevated, introduce a cylindrical speculum so as to expose the cervix uteri and vault of the vagina. Into this speculum pour a 3 per cent. aqueous solution of nitrate of silver. Allow this solution to bathe the cervix uteri and vault of the vagina for five minutes, then remove the solution by means of absorbent cotton. This treatment should be repeated two or three times a week.

The diet should be non-irritating. Urethral or bladder complications call for diuretic drinks. Crayons of ichthyol, aristol, or dermatol in the urethra, if tolerated, may be useful.

Erysipelatous Vulvo-vaginitis.

Erysipelas is primarily an inflammation of the lymphatic vessels of the skin or mucous membrane. The infection is caused by a streptococcus similar to the streptococcus pyogenes—perhaps identical with it. The disease is febrile, always acute, often suppurative and superficial, and chiefly characterized by a tendency to spread. There are three varieties: the erythematous, the vesicular, and the gangrenous.

The Erythematous erysipelas of the vulva and vagina is the mildest form. It presents redness and heat of the surface. The skin or mucous membrane is but little swollen, and the tendency is strongly toward spontaneous recovery.

The Vesicular form is more severe, is characterized by intense inflammation of the skin or mucous membrane, by marked œdema, and by the appearance under the surface of vesicles or bullæ which, like

blisters, contain serum. Finally, infection in these vesicles may cause suppuration, and the inflammation may extend to the deeper structures and become phlegmonous.

The Gangrenous is the most dangerous form of erysipelatous vulvitis. It apparently results from rapid development of the streptococci and their products in the lymph channels and connective-tissue spaces so as to shut off nutrition and cause necrosis. It results in the destruction of large areas or of small patches of skin or mucous membrane.

Phlegmon is often associated with erysipelatous vulvitis. It involves not only the lymphatic vessels, but also the glandular elements and the deeper connective tissue. The inflammation may be diffuse or circumscribed, and may terminate by resolution or by suppuration.

Erysipelatous vulvo-vaginal inflammation occurs not infrequently in very young infants by extension from the navel, or it may spread from the vulva to the thighs and nates; it is sometimes observed in childhood, but is rare in adults, except in childbed, where it is a most dangerous affection. Bad nutrition and filth are strong predisposing causes. The prognosis is ordinarily more grave in infants than in children or adults. Generally speaking, the prognosis is favorable, doubtful, or grave according to the extent and severity of the disease. Gangrene of the vulva, especially in infants, is almost always fatal.

Treatment does not differ materially from that of the diphtheritic form; see below. If the inflammation become phlegmonous and result in suppuration, the abscess should be opened. The gangrenous variety calls for rigid disinfection with pure carbolic acid and strong supporting measures.

Diphtheritic Vulvo-vaginitis.

This form of vulvo-vaginal inflammation rarely occurs in the non-puerperal adult. It attacks children during epidemics, and is then usually communicated from diphtheria which has originated elsewhere. It is more commonly the local manifestation of a very grave form of puerperal fever which sometimes occurs in epidemics, especially in the obstetric wards of hospitals.

There are other forms of membranous vulvo-vaginitis in which the germ of diphtheria is not present—pseudo-diphtheritic vulvo-vaginitis.

Treatment. The general treatment includes energetic supporting measures, such as quinine, the mineral acids, tincture of chloride of iron, and sometimes heart stimulants. The bowels should be regulated, if necessary, by mercurials and salines. The local treatment is the same as in the general therapeutics of vulvo-vaginitis: antitoxin and other measures are indicated as for diphtheria elsewhere.

Tubercular Vulvo-vaginitis—Lupus.

Tubercular inflammation has been found in every part of the genital tract, the order of frequency for the various parts being

[illegible] vagina, cervix uteri, and [illegible] characteristic symptoms; the diagnosis depends [illegible] the bacillus tuberculosis. The disease is often secondary [illegible] some extra-pelvic organ, although it may be primary [illegible] It is probable, though not certain, that tubercular [illegible] may be the result of coitus.

Tubercular ulcers, commonly called lupus, is rare; the occurrence [illegible] is usually to the period of maturity. The [illegible] are: first, the formation of tubercles and [illegible] which undergo cheesy or colloid degeneration, and, finally, ulceration and cicatrization; second, a variable increase of connective [illegible] throughout the affected area.

[illegible] red color, with a granular base. It may be superficial or deep as to make permanent fistulæ between the bladder, [illegible] rectum. The cicatricial contraction which follows the ulceration may even result in strictures of the urethra, vagina, or [illegible]. The ulcers are purulent and have a tendency to bleed.

Hypertrophic processes may or may not be associated with ulceration. The general thickening and induration of the affected [illegible] may be so extensive as to give the labia the appearance of [illegible] elephantiasis. The vulva and perineum become studded with nodules of a red or violet color. Lupus, in clinical appearance and [illegible] closely resembles some tumors that it has often been described as a neoplasm.

Chronicity and little pain are notable characteristics of the disease. The general health may continue unimpaired for many years.

The treatment of tubercular vulvo-vaginitis is the same as that [illegible] tuberculous disease elsewhere—*i. e.*, systemic and local. Proper [illegible] nutritious diet, careful attention to nutrition, and thorough ventilation. Early excision of the diseased part together with a [illegible] of healthy tissue around it gives good promise of radical cure. Tuberculous infection of the vulva and vagina has been, in many instances, with apparent success, subjected to treatment by exposure [illegible] to rays. The time has not arrived for a positive statement as [illegible] to the value of this treatment.

Mycotic Vulvo-vaginitis.

Etiology. This form of infection is most common in diabetic [illegible] certain fungi—mycoses— chief among them the leptothrix [illegible] monilia, are often found in the vulvar secretions, and are [illegible] the exciting cause of mycotic vulvitis. Diabetic urine apparently favors the development of the fungi, although the disease is not always associated with sugar in the urine. Furunculosis often [illegible] diabetic vulvitis.

Vulvo-vaginitis and vaginitis, not only in diabetic, but also in non-diabetic women, have been observed in connection with certain other fungi—leptothrix and oïdium albicans.

Catarrh of the genital tract and pregnancy are predisposing causes. The micro-organism may be brought in contact with the genitals by

intercourse, especially with a diabetic man. The fungus may be carried on the finger of the gynecologist. Winckel cites two cases in which the infection apparently was traced to the touching of the genitals by the hand dusted with flour.

The itching and burning are continuous and the pruritus is extreme. The depressing influence of the hypersecretion, sleeplessness, pain, and loss of appetite, is apt to hasten the fatal result of the diabetes. The vulva throughout has a coppery-red color, is much swollen, and is dry in some parts and moist in others. Scratching may cause here and there considerable bleeding. The skin is dry and brittle, wrinkled and rigid. The affection usually invades the folds of the groin, the mons veneris, and the folds of the nates, and may surround the anus. An improvement in the general condition of the patient may lessen the local disease. It usually returns, however, and with increased severity.[1]

Symptoms, Diagnosis, and Prognosis. The leptothrix causes less distress than the oïdium albicans. The latter may induce severe itching, burning, heat, and increased secretion. The swelling of the vagina may extend to the vulva, and then be so great that the patient cannot stand nor walk. The epithelium is exfoliated and the urine causes pain when in contact with the exposed surfaces. The irritation may be extreme and paroxysmal.

Vulvo-vaginal mycosis usually begins with a subacute inflammation which extends throughout the vagina. In the vulva the inner surface of the nymphæ and the folds about the meatus urinarius are chiefly affected. Small yellow spots upon the reddened mucous membrane or skin, which cannot be scraped off without at the same time removing the epithelium, are characteristic of the disease. These spots, taken together with finding the micro-organism by microscopic examination, will establish the diagnosis. The prognosis is variable. The disease sometimes disappears in a few days under treatment. In pregnant women it may continue until after delivery.

Treatment. This often includes attention to the associated diabetes. A diabetic dietary, tonics, and mild saline laxatives are first indicated. The intolerable itching and burning necessitate local remedies, of which many have been used with varying and temporary success. Wash thoroughly with a tepid solution of corrosive sublimate, 1 to 2000, or with a saturated solution of boric acid. Benzoated oxide of zinc ointment, or an ointment of vaseline and salicylic acid, 1 to 200, is useful. The sitz-bath, temperature 80° F., prolonged for an hour, often gives relief; to this bath may be added a pound of Indian meal. Astringent washes of tannin or alum, or sulphate of zinc, may be indicated.

Since the skin in mycotic vulvitis is already dry and brittle, it is not well to dust the vulva with powder. To relieve the suffering, which is usually worse at night, place a compress moistened with a 3 per cent. solution of carbolic acid on the parts at bedtime.

Anodynes may be used locally; one part of chloroform to five

[1] Winckel. Diseases of Women.

parts of almond oil, ointments of belladonna and morphine, or a 6 per cent. solution or ointment of cocaine may give temporary relief. The disease in a diabetic subject is usually intractable or incurable. See Furuncular Vulvitis and Pruritus Vulvæ.

Mycoses of the vulva and vagina in subjects not suffering from diabetes are usually self-limited or easily cured by the treatment above indicated. The vaginal mycoses require douches of carbolic acid, 3 per cent., or of corrosive sublimate solution, 1 in 2000. The mycoses of pregnancy are usually limited to that state.

Syphilitic Vulvo-vaginitis and Chancroid.

The subject includes the primary, secondary, and tertiary forms of syphilis.

Chancre develops not until after an incubation of from ten to twenty days, usually the latter. It is first a reddened excoriated spot or a hardened papule with or without ulceration. The characteristic feature is induration. The induration may be parchment-like and superficial, or it may be deep and reach laterally far beyond the edge of the erosion or ulceration. The indurated tissue is hard, like cartilage. In the ulcerative form the ulcer is usually small and funnel-shaped, with sloping edges, superficial or deep; the edges are never undermined. The bottom of the ulcer is gray, the discharge sero-purulent and never free. Rarely more than one chancre ever appears in the same person. The inguinal glands usually enlarge, but do not suppurate. Chancre is only the local sign of syphilis, and its pus is rarely, if ever, auto-inoculable.

Chancroid, which is a purely local infection, has no period of incubation, is auto-inoculable, has a rounded or oval margin, abrupt or ragged edges, no induration, and may develop into a large or phagedenic ulcer. The inguinal glands are prone to suppurate. Large numbers of chancroids may occur on the same person.

The secondary and tertiary lesions of syphilis include mucous patches and gummata. The presence of these patches upon the genitals in no respect modifies their general character.

Treatment. The treatment is that of syphilis or, as the case may be, chancroid. The local lesions may be complicated with other forms of vulvo-vaginitis, which should have special attention according to their class. The treatment of the syphilitic lesions in the genitals is the same as when they occur elsewhere.

Superficial Vulvitis and Vaginitis.

This is sometimes called simple inflammation. When acute it often produces mild systemic fever and sometimes excessive swelling, pain, and irritation. The disorder is erythematous and resembles urticaria, It does not give rise to much exudate, is not very virulent, and seldom or never extends to the follicular or glandular elements or to the uterus. It tends to rapid resolution on removal of the irritating cause. It often causes excessive œdema of the labia minora, which may disappear in a few hours.

The causes of superficial vulvitis and vaginitis are often largely mechanical, such as masturbation, excessive coitus, rubbing, scratching, presence of pinworms or the parasites of the tænia circinata. Irritating vaginal or uterine discharges—stale urine, and cancerous ichor—are among the chemical causes. The inflammation may be in the form of vulvitis, vulvo-vaginitis, or vaginitis. It does not involve the corium in the vulva nor the submucosa in the vagina. The mildness of the affection is due to the lesser virulence of the exciting cause or to its superficial location, or to both. The treatment has already been described in the general therapeutics of vulvo-vaginal inflammation.

Senile Vulvo-vaginitis.

Senile vulvo-vaginitis is usually, though not always, a somewhat deep inflammation. The retrogressive physiological processes of the menopause which result in senile atrophy of the reproductive organs, destroy in great part the epithelial portion of the mucous membrane of the uterus and vagina; it has also the same effect upon the muco-cutaneous covering of the vulva, and the lining of the uterus, vagina, and vulva becomes largely composed of fibrous tissue. This fibrous tissue when inflamed is prone to granulate, to suppurate, to cicatrize, to contract, and to form adhesions of any surfaces in contact with one another. Stenosis at the internal or external os uteri may prevent free drainage of the uterine secretions. These secretions, already pathological, when retained become excessively irritating. Similar secretions also come from the vagina and vulva. Aged women, therefore, who have long passed the menopause, are subject to a most irritating vulvo-vaginitis—a most exhausting and distressing pruritus vulvæ. The adhesions often entirely envelop the vaginal portion of the cervix and may partially obliterate the vagina. The vulvar glands and mucous crypts, especially in pruritus cases, are extensively involved. Removal of them is the only means of relief from the intolerable itching and burning. See Treatment of Glandular Vulvitis below. In other respects the treatment is the same as that already laid down in the general therapeutics of vulvo-vaginal inflammation.

Glandular Vulvitis.

Inflammation of the Urethral Crypts. Five or six small racemose glands are situated around the meatus. They have short ducts with wide openings; two of them are in little depressions on either side of the meatus. Inflammation in these glands or crypts, not uncommon during and after the menopause, may cause a most persistent pruritus with extreme itching and burning; this occurs most frequently in connection with senile vulvitis.

Inflammation of the Vulvo-vaginal Glands. The vulvo-vaginal glands of Bartholin are on either side of the vaginal orifice near the posterior extremity of the bulb of the vagina. Their ducts are about one-half inch long and open into the fossa navicularis.

Inflammation of these glands comes by extension from the external

surface. The glands, or their afferent ducts, or both, may be involved. A suppurating gland may pour out pus through the duct; or the duct may close by adhesive inflammation and form an abscess; it may become occluded and distended with the normal secretion of the gland, and thus form a retention-cyst. One or both glands may be affected. The disease is very common.

Diagnosis. Abscess is distinguished from retention-cyst of the glands by the presence of acute pain and heat in the former and the absence of them in the latter. Enlargement of the gland under either of these conditions is distinguished from phlegmonous vulvitis by the location of the former, which corresponds to that of the gland, while phlegmon may be anywhere in the vulva; and from hernia by

FIGURE 110.

Enlargement of the vulvo-vaginal gland by cyst or abscess.[1]

FIGURE 111.

Right inguinal hernia simulating vulvo-vaginal cyst or abscess.[2] Eversion of anterior and posterior vaginal walls.

the absence of the characteristic signs of hernia and by the location. (See Figures 110 and 111.)

Glandular vulvitis, once established, is prone to become chronic. The glands serve as culture-ground for the infecting bacteria, hence superficial vulvo-vaginitis, though apparently cured, may again and again recur from the infected glands. The vulva, through its glandular structures, is a great distributing point of pelvic infection. The periodical congestion of menstruation is a recognized predisposing cause of recurring pelvic inflammation. The capacity of glandular structures to receive, retain, and distribute infection will often explain the frequently observed attacks of recurrent gonorrhœa in women.

An explanation of latent gonorrhœa in the male, discussed by Noeggerath, may be the same as that given in the preceding paragraph for recurrent gonorrhœa in women.

[1] Schaffer. [2] Ibid.

The Treatment of Glandular Vulvitis, when acute and non-suppurative, is palliation and cleanliness, the latter to be secured chiefly by disinfectants. When the inflammation is chronic the treatment varies with the different glands, as follows:

The five or six small mucous crypts near the meatus urinarius, when infected, are the seat of an intolerable pruritus. The treatment is to destroy the glands by the actual cautery or to remove them by excision. The author's preference is to excise them, close the wounds by suture, and secure first intention.

The treatment of an abscess of a vulvo-vaginal gland is the same as for abscess following phlegmonous inflammation; it should be opened widely, the wound packed with gauze, and made to heal from the bottom by granulation. In opening the abscess find the gland, if possible, and remove it.

When a retention-cyst has formed from occlusion of the duct, the sac should be dissected out, the wound sutured and drained with a small rubber tube or with gauze. If drainage is not used, the wound usually suppurates.[1] Sometimes chronic suppuration of the gland occurs through the open duct. Then the duct should be incised widely, the gland removed, and the wound packed with gauze, or sutured and drained as described above.

Follicular Vulvitis.

The labia minora and majora are supplied abundantly with hair-bulbs, sebaceous follicles, and sweat-follicles. Inflammation in these structures is follicular vulvitis or folliculitis. The general appearance of the surface, except slight congestion, is unchanged. The inflamed openings of the follicles scattered over the labia minora and majora are small, red, elevated, and swollen. Children are not subject to folliculitis. The inflammation may originate in the follicles or may extend to them from the external surface, as in glandular vulvitis. The infection often remains entrenched in the follicles long after it has disappeared from the external surface, and from these lurking-places may again and again reinfect the surface.

Adhesive inflammation may close the openings of the ducts; then the secretions will be retained and form abscesses as large as a pea; otherwise the discharge is abundant, purulent, and often offensive.

Treatment of Follicular Vulvitis. The disease may be seated so deeply that it resists all surface applications, and yields only to direct deep cauterization strong enough to destroy the secreting structures. For this purpose, use the fine galvano-cautery needle or the point of a probe made red-hot in the flame of a spirit-lamp.

In follicular vulvitis with occlusion open each follicle with a small, sharp-pointed knife, and then apply the fine-pointed conical solid stick of nitrate of silver. This may be done under cocaine without pain. A dressing of sterile gauze saturated with formalin 1 : 1000 placed as a pad over the vulva is a most serviceable application.

[1] The author published this operation in the Chicago Medical Review in 1880.

FIGURE 112.

Follicular vulvitis.[1]

Furuncular Vulvitis.

Furunculosis usually starts in the hair-follicles and extends to the surrounding cellular tissue. The resultant boil may be developed at numerous points in the labia majora, where the disease is usually confined. Some women have an unexplained tendency to this form of vulvitis. Furunculosis is common in diabetes. The author has observed that glycerin tamponade is apparently an exciting cause of boils. The incipient boil may often be aborted by pulling out the hair from the inflamed hair-bulb, thereby giving drainage.

The Treatment of furunculosis is the same in the vulva as elsewhere—*i. e.*, open and drain the abscess. Numerous boils sometimes follow one another, or occur in successive clusters in one locality. Such recurring infection is usually due to the presence of the microbes of suppuration, which remain on the surface ready to produce reinfection at any favorable point. Daily cleansing of the surface and thorough disinfection with the ointment of biniodide of mercury (1 : 60) for two weeks after the last boil has disappeared are effective means of prophylaxis.

Emphysematous Vaginitis.

This rare disease occurs mostly in pregnancy. It is characterized by numerous small, soft cysts of variable size situated just under the surface and commonly on the posterior wall of the vagina. These cysts contain serous fluid and gas. The affection is usually asso-

[1] From Thomas and Mundé.

ciated with other forms of vaginitis. The diagnosis may be verified by pricking the cysts; then the gas escapes with a blowing sound. In pregnant women the cysts disappear without treatment at the end of pregnancy.

Treatment. In puerperal cases the treatment is expectant. In non-puerperal cases, if the cysts do not disappear under antiseptic douches, they should be opened and the vagina packed with antiseptic gauze.

Paravaginitis.

Paravaginitis, sometimes called dissecting vaginitis, is a rare disease which involves the submucous connective tissues. Burrowing abscesses are formed with perivaginal fluctuations. The musculature of the vagina and vulva, in whole or in part, may separate and slough off in a gangrenous mass. The cicatricial contraction which follows will then cause stenosis or atresia. It is often impossible in such cases to restore the calibre of the vagina or vulva by operative measures. Secretions of blood or menstrual fluid may accumulate above the atresia in the vagina, uterus, or Fallopian tubes. This disease is usually due to a grave infection by the streptococcus or by the germ of diphtheria.

Treatment. The pus should be freely evacuated as soon as it is discovered. If sinuses form, they should be incised and drained. Plastic operations and dilatation may be required to overcome cicatricial contraction and possible atresia. Atresia from this cause is not to be confused with the congenital atresia described in the chapter on Malformations.

CHAPTER XII.

ECZEMA VULVÆ, HERPES VULVÆ, KRAUROSIS VULVÆ, PRURITUS VULVÆ, HYPERÆSTHESIA VULVÆ, VAGINISMUS.

Among the disorders allied to vulvo-vaginal inflammation are eczema vulvæ, herpes vulvæ, kraurosis vulvæ, pruritus vulvæ, and vaginismus.

Eczema Vulvæ.

Eczema vulvæ is an infrequent disease, and is confined mostly to pregnancy. Scrofula, rheumatism, and the uric acid diathesis are frequently strong factors in the causation of eczema. It may be acute or chronic. The eruption consists of nodules, vesicles, pustules, and scabs, with variable redness, swelling, and moisture of the skin. The vesicles contain serous fluid. Pus is found under the scabs in the more severe cases. The skin and sometimes the subcutaneous tissues are infiltrated. Acute eczema may remain local and terminate within two weeks. Chronic eczema, often intractable, may extend to the mons veneris, thighs, and nates, with swelling and suppuration. The labia majora most commonly are involved.

Treatment. The general treatment consists of mercurials and salines, non-irritating diet, avoidance of wine and liquor, and hygienic living. The local treatment varies with the condition. Whenever the subcutaneous structures are exposed, the solid nitrate of silver point should be applied, care being taken to touch only the exposed surfaces. Oftentimes numerous very minute abrasions may be seen with the unaided eye or through a magnifying glass. These should be delicately touched with the finest point of nitrate of silver. The application should be repeated every five days until the abrasion disappears. The following ointment is useful:

Ointment of rose-water	1 ounce.
Lanolin	2 drachms.
Oxide of zinc	1 drachm.
Boric acid	1 "
Ammoniated ichthyol	40 grains.
Thymol	5 "

The parts should be kept clean and dry. Dusting with bismuth often gives relief.

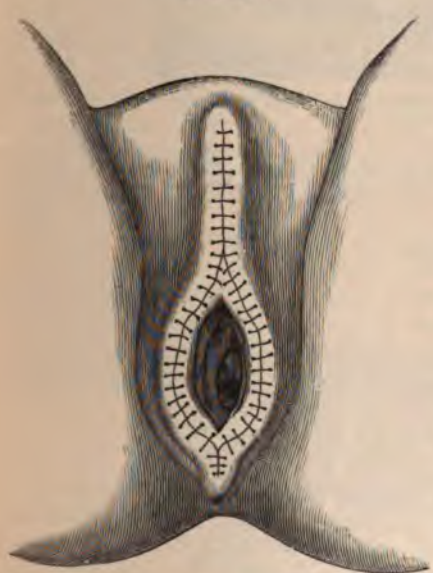
Herpes Vulvæ.

An herpetic eruption, not unlike herpes labialis, is occasionally observed upon the vulvar labia. There is little redness or swelling The disease is usually self-limited; like herpes in other places, it runs its course in a few days and disappears.

Kraurosis Vulvæ.

Kraurosis vulvæ as the name indicates, is a shrinking of the vulva; its literature dates only from 1875.[1] The disease is characterized by atrophy of the cutaneous covering of the vulva, especially of the inner surface of the nymphæ. The skin appears dry and shrunken. The surface has the tense, glistening appearance of scar tissue, and the disease differs from eczema in its atrophic processes. The affection causes distressing paroxysms of itching and burning pain in the diseased part. Sometimes the vulvar orifice is extremely contracted. The clinical features are so characteristic that once recognized they will never be mistaken for those of any other disease. The hair around the vulva is thin and dry, and late in the disease almost entirely absent. The vulva appears small and infantile, the labia minora are shrunken and, finally, almost absent; the skin is pale, without pigment, but studded with numerous irregularly-shaped reddish-brown blood spots, which on inspection appear slightly depressed below the surface. These spots are confined entirely to the vestibule, but disappear in the later stages of the disease. The skin is dry, sometimes cracked, abraded, and occasionally gives forth a slight, brown, purulent discharge. The natural elasticity of the vulva is entirely lost. The orifice is so contracted as usually to prohibit the introduction of the speculum. The sensitiveness of the parts is very great, especially while the brown spots are present. This, together with the tenseness of the vulvar orifice, causes extreme dyspareunia; in fact, usually prohibits coition.[2]

FIGURE 113.



Lines of union in Longyear's operation for kraurosis vulvæ.[3]

The Pathology of this disease is not fully known. In addition to the foregoing pathological changes, may be mentioned a thickening of the layer of epidermis, decrease in the number of sebaceous glands, and sclerosis of the connective tissue. The tightly contracted skin is so stretched over the parts that even the pressure of the examining finger may make deep rents.

[1] Robert F. Weir: Ichthyosis of the Tongue and Vulva, New York Medical Journal, March, 1875. Breisky: Kraurosis Vulvæ, Centralblatt für Gynäkologie, 1885, p. 358. Lawson Tait: Diseases of Women, Lea Bros. & Co., 1889, p. 53. C. A. Reed: Trans. American Association of Obstetricians and Gynecologists, 1894. Howard Longyear: Ibid., 1895.

[2] Adapted from Longyear. American Obstetrical Journal, 1895.

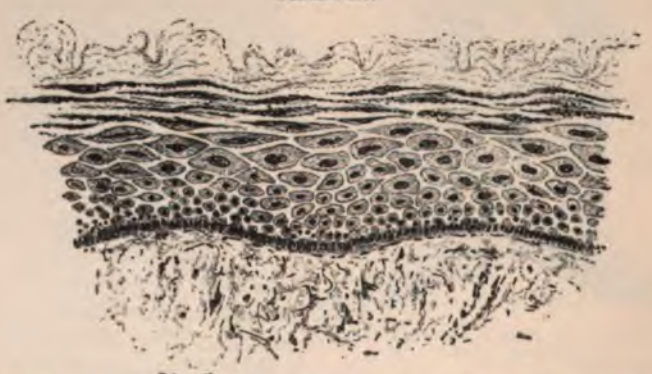
[3] From Bonnet and Pettit. Traité Pratique de Gynécologie.

FIGURE 114.

Kraurosis vulvæ. Clitoris and labia minora completely atrophied; the labia majora flattened and wrinkled.[1]

Longyear has observed a deep cirrhotic-like band of fibrous tissue entirely separate from the cutaneous covering. He regards this band

FIGURE 115.



Kraurosis vulvæ. Marked hornification of the corium with round-cell infiltration; papillæ are absent.[2]

as the essential lesion, and gives to the superficial changes a secondary importance. This fibrous band replaces the loose cellular tissue

[1] Gebhard. [2] Ibid.

through which the nutrient vessels pass to the skin, and by its gradual and continual contraction causes not only the vulvar shrinkage, but also the strangulation of the bloodvessels which pass to and from the overlying cutaneous structures. This disturbance in circulation explains the spots of ecchymosis in the earlier stages of the disease, and the atrophic changes in the later stage. The pain is explained by mechanical pressure on the nerves and by the resultant neuritis and perineuritis.

Treatment. This new formation of fibrous tissue is of special interest from the surgical standpoint. Clearly the removal of this band, together with the contracted superficial structures, is essential to the cure of the disease. The usual operation of removing the degenerated and contracted muco-cutaneous structures may relieve the acute symptoms, but can have no effect on the stenosis. Spontaneous recovery is sometimes reported; but this is only a relief from the supersensitiveness of the vulva, never from the constriction. The fibrous band, unless removed by operation, is permanent. Longyear's operation is analogous to the Whitehead operation for hemorrhoids. It consists in the removal of all the superficial diseased structures, together with the fibrous band beneath, and union of the external and internal margins of the wound. An incision with scissors is first made along the lateral and posterior margins of the vulvar orifice, dividing the diseased structures from the healthy skin; then the margin of the diseased tissue, including the fibrous band, is seized with dressing-forceps and dissected loose from the underlying tissues to the vaginal inlet. This tissue is then cut away. The anterior vulvar structures are dissected loose in the same manner, care being taken to cut carefully round the urethral orifice. After removing all the diseased structures in this way, the margin of the healthy vaginal wall above is pulled down and dissected loose from the underlying parts around the whole circumference of the vagina. This loosening of the vaginal wall permits the inner margin of the wound to be brought down to the outer margin. The two margins are then united with deep silkworm-gut and superficial catgut sutures, or with fine buried formaldehyde catgut. Complete relief has followed the operation.

Pruritus Vulvæ.

In neuropathic cases of vulvar inflammation the irritation, itching, and burning are intense, intolerable, intractable, and thereby constitute a condition called pruritus vulvæ. Because the nervous element often predominates the disease has been classed as a nervous affection. Pruritus is, however, rather a symptom than a disease. It may arise from a variety of causes, may extend over the adjacent mucous surfaces, and is often aggravated by efforts to get relief by scratching; in this way the habit of masturbation is sometimes formed. The intense suffering causes loss of sleep, exhaustion, and sometimes alarming nervous depression. Sexual excitement and orgasms may occur. Pruritus may be complicated by melancholia, hystero-neuroses, and other forms

of insanity. These psychoses may or may not be dependent on the disease. In many cases a paroxysmal wave recurs with great violence upon exercise or upon getting into a warm bed. The nervous element has not been adequately explained; it may be a cause, or an effect, or a coincidence. Oftentimes the inflammatory element is insignificant or apparently absent.

The Pathology of pruritus is not fully known. It is considered by some authorities to be of purely nervous origin; by others, who follow the lead of modern etiological theories, as of bacterial origin. The truth lies between the two extremes. There may undoubtedly be an irritation of the sensory nerves of the vulvar skin of purely neuropathic origin; when this irritation occurs it is usually aggravated by the presence of more or less vulvitis. The tangible pathology is largely, therefore, the same as has been already described under vulvitis.

Etiology. It follows from the above that the causes of pruritus will include those of vulvitis. Numerous attempts to explain the causation of pruritus have sometimes made up in scientific elaboration what they lacked in clinical value.[1]

The following classes of causes are worthy of consideration:

1. Circulatory causes.
2. Secretory causes.
3. Parasitic causes.
4. Mechanical causes.
5. Thermic causes.

1. *Circulatory causes.* In certain disorders, such as icterus, diabetes, chronic nephritis, the blood contains bile, urea, or sugar, all of which may, by action on the nerve-endings, cause itching of the parts. Morphine, alcohol, or iodoform sometimes has a similar action.

Erythema, herpes, urticaria, and other such skin disorders which involve stasis hyperæmia, may occur in the region of the pudendal and hemorrhoidal veins; they are then characterized by the intense pruritus which they cause.

2. *Secretory causes.* Abnormal secretions of the vulvar cutaneous glands, vagina, or uterus may, especially if combined with the above-mentioned causes, produce great irritation in the terminal sensory nerves of the vulva. Secretions from the diseased bowel or anus may by chemical action produce pruritus ani and, by extension, give rise to pruritus vulvæ.

3. *Parasitic causes.* Animal parasites, such as pediculi and ascarides, and vegetable parasites, such as leptothrix, oïdium, and leptomitus, and the ordinary bacteria of inflammation have been presented under Vulvo-vaginitis. The vegetable parasites give rise to a skin disease sometimes called prurigo.

4. *Mechanical causes* include masturbation, immoderate handling, and scratching.

[1] A most elaborate and scientific discussion of the etiology of pruritus has been contributed by Sänger. Centralblatt für Gynäkologie, 1894, No. 7.

5. *Thermic causes.* Heat and cold are known to cause a peculiar pruritus, called in winter pruritus hyemalis and in summer pruritus æstivalis.

Above all these causes another and more essential element must be taken into the account; it is what Goodell once called the invisible, intangible, and imponderable influence on the nervous system; it is the difficulty, not to say the impossibility, of reckoning with this element that often makes the disorder persistent or intractable. The most that can be affirmed with our present limited knowledge is that there is an irritation of the sensory nerve-organ of the skin, and that many causes may contribute to its excessive development. Whatever the tangible lesion may be, nervous irritability and hyperæsthesia are always essential elements.

Intolerable itching of the anus is a frequently recognized accompaniment of habitual constipation, and is often associated with pruritus vulvæ. This may be explained by the fact that the vulva is innervated by the same nerves that supply the anus. The intestinal leucomaïnes which have been recognized as a cause of pruritus ani may therefore also cause pruritus vulvæ.

Symptoms and Course. The irritation is apt to occur in paroxysmal waves. The paroxysms may recur after vigorous exercise, especially in warm weather, before or after menstruation, or upon exposure to artificial heat. In some cases they appear upon getting into a warm bed. The desire to rub or scratch for the relief of the irritation is almost irresistible. This instinctive effort at counter-irritation greatly aggravates the pruritus. As Thomas aptly remarks, "the disease and the remedy which instinct suggests react upon one another, the first requiring the second, and the second aggravating the first, until a most rebellious and deplorable condition is developed; the patient, bereft of sleep by night and tormented constantly by day, finally gives way to despondency and depression." The loss of sleep, the use and abuse of anodynes, and the neurosis incident to the disease may even contribute to the development of melancholia or some other form of insanity.

The pruritus may extend to the vagina, anus, thighs, and abdomen. In some cases the irritation begins in the anus.

Diagnosis and Prognosis. Pruritus is not a disease, but a symptom; diagnosis must therefore depend upon the identification of the causative lesion. In so far as the disease depends upon tangible and visible conditions the diagnosis and prognosis will follow along the lines already laid down in Chapter V., on Vulvitis. A clear appreciation of the special etiology of the disorder as given above will in a majority of cases open the way to accurate diagnosis.

Without great care the examination may fail to disclose the point and source of irritation. An irritating discharge, for example, so slight as to be unknown or ignored by the patient, may be sufficient to produce the most distressing irritation, and may therefore have the utmost significance.

In the vast majority of cases one or more of the following condi-

tions will be found present, and will partially or wholly explain the irritation:

Vulvitis;	Ichorous discharge from cancer;
Vaginitis;	Incontinence of urine;
Endometritis;	Pathological urine;
Urethritis;	Intestinal disease;
Urethral caruncle ·	Vulvar eruptions;
Parasites;	Onanism.

Most commonly associated with pruritus are vulvitis, vaginitis, and endometritis. The fact that these diseases do not commonly produce the disorder is explained by the absence of the essential neurosis. Senile vulvo-vaginitis is most prone to cause excessive irritation, and the pruritus when due to this cause is exceedingly obstinate.

The pruritus of pregnancy and the menopause is commonly limited to those states. In general the prognosis is indeterminate.

Treatment. The treatment of vulvo-vaginitis already laid down is necessarily a part of the treatment of pruritus vulvæ.

A multiplicity of remedies recommended in the therapy of any disorder may be taken as evidence that our resources are limited or that the disorder may result from one or more of a wide variety of pathological conditions. Both of these propositions are true of pruritus vulvæ.

It is clear that the treatment must be directed to the cause of the irritation; to this end the reader is referred to the therapy of vulvo-vaginitis and of the numerous diseases and disorders already mentioned under Etiology and Diagnosis.

In many cases the irritation is apparently the outcome of pent-up sexual energy. It is a common observation that a neurotic woman who suffers intensely from pruritus has entire relief upon the return of her husband from a prolonged absence.

While the radical treatment is in progress palliative measures are always demanded for the immediate relief of the urgent symptoms. Fortunately, most of the palliative measures, since they allay irritation, are in a degree curative. In order to remove irritating discharges, one may use sitz-baths and vaginal douches of water or antiseptic solutions.

The following local applications may give relief:

The surfaces after each bath may be dried and freely dusted with calomel, bismuth, starch, or lycopodium powder. The calomel is generally preferable.

A vaginal tampon of gauze will often protect the vulva from the discharge, and thereby give temporary relief. The tampon may to advantage be saturated with a solution of acetate of lead in glycerin, one drachm to the ounce.

Great relief is sometimes experienced from a gauze compress over the vulva, saturated with the dilute solution of subacetate of lead and laudanum, equal parts. The compress should be frequently changed.

A compress saturated with a solution of corrosive sublimate, 1 to 1000, is, perhaps, the most effective single remedy. This application or some form of mercurial inunction will act as if by magic when the cause is parasitic.

Cloths wrung out in very hot water and applied to the vulva, just before the patient goes to bed, may relieve or prevent the paroxysm which comes on after retiring.

A strong infusion of tobacco,[1] both as a vaginal douche and on the vulvar compress, is said to be most efficacious.

Ointments are useful from the soothing effect of their constituents and because they protect the parts from contact with irritating discharges. They are also an excellent vehicle for the application of parasiticides.

In rare cases the pruritus is due to a growth of short, stiff, inverted hair on the labia majora or pubes. This condition is called *trichiasis.* Prompt and permanent relief follows the removal of the hairs and the destruction of their bulbs by electrolysis.

The treatment of the disorder, if due to the diabetic, uric acid, or other diathesis, must include the appropriate dietetic and other hygienic measures.

In a case, in which the neurotic element prevailed,[2] prompt and complete relief is reported to have followed the smoking of tobacco.

Painting the vulva with pure ichthyol has been known to effect a radical cure. In a case observed by the writer, an accidental application of pure carbolic acid was followed by permanent cure.

Highly seasoned and highly nitrogenous food and stimulating beverages aggravate the irritation, and should be avoided. For the same reason scratching and rubbing of the part are injurious.

Finally, there is danger of forming the habit of using cocaine, morphine, or other narcotics; for this reason their use should be guarded with judgment.

When apparent causes have received due attention, and the disease has resisted all treatment, operative interference may become necessary.

Sänger's conclusions on this point are based upon experience, and deserve attention. He says:

(1) The partial or total extirpation of the vulva is a legitimate operation that should often be performed in chronic, otherwise, incurable *pruritus vulvæ.* He calls it *vulvitus pruriginosa.*

(2) The removal of the glans clitoridis, especially in elderly women, when the nerve terminations have usually lost their specific sensibility by reason of the disease, is permissible.

(3) In younger persons, if the irritation is circumscribed, one may try to give relief by a partial operation without removal of the clitoris. In elderly women, and sometimes even in younger women, when the disorder is extensive, the whole vulva should be extirpated and the parts repaired by a corresponding plastic operation. See Surgical Treatment of Kraurosis Vulvæ.

[1] Thomas and Mundé. Diseases of Women.
[2] Thomas, in Thomas and Mundé. Diseases of Women.

Hyperæsthesia of the Vulva.

Thomas[1] has described, under this name, a rare disorder of the vulva which occurs in hysterical and despondent women at or near the menopause. It consists of an excessive sensibility of the nerves supplying the mucous membrane of some part or all of the vulva.

The slightest friction excites intolerable pain and nervousness; even a current of cold air produces discomfort, and the least pressure is intolerable. Sexual intercourse is often impossible.

The disease is sometimes associated with vulvitis or a painful urethral caruncle; in other cases no tangible or visible cause can be found. It differs from pruritus by the absence of itching, and from vaginismus in not causing spasmodic contraction of the vagina.

The Treatment is unsatisfactory. Even the complete destruction of the mucous membrane of the sensitive area with caustics, or its excision, has failed to give relief. Sexual intercourse should be prohibited and the patient placed in hygienic surroundings and with cheerful company. The general treatment is by tonics, sea-bathing or warm-water bathing, and massage. Local lesions, if present, are treated according to their special indications.

Vaginismus.

Like pruritus vulvæ, this rare condition is not a disease, but a nervous symptom due in some cases to appreciable, in others to unknown causes. It is characterized by spasmodic contractions of the muscles surrounding the vulva and lower portion of the vagina. The condition is analogous to laryngismus. The spasms occur upon attempted coitus or upon the attempt to make a digital or speculum examination. The writer has observed one strongly neurotic case in which the woman declared that the spasm occurred violently whenever coitus was attempted, but not the slightest objection was made to digital or speculum examination.

Etiology and Clinical Course. The condition is mostly confined to young neurotic, hysterical women. The palpable or visible lesion is usually in the form of an irritable hymen or an irritable caruncle of the meatus urinarius. If the hymen has been ruptured, the irritation will be in its remains—the carunculæ myrtiformes. These caruncles and the urethral caruncle in some cases contain a superabundance of excessively sensitive and large nerve-filaments. They, in fact, may resemble neuromata. In other cases the sensitive caruncles are absent, and the vaginismus is characterized only by an excessively sensitive vaginal outlet, which may or may not be the seat of inflammation or erosion. Repeated attempts at coitus against an unyielding intact hymen may give rise to vulvitis and extreme tenderness—a condition which should not be confounded with vaginismus.

There may be no appreciable cause of the disorder save a progressively increasing nervous apprehension on the part of the wife; each attempt gives rise to greater nervous excitement until the pain and fear

[1] Thomas and Mundé. Diseases of Women. Adapted from Garrigues' Diseases of Women.

of coitus and the extreme spasmodic contraction of the levator ani and neighboring muscles which form the sphincter vaginæ preclude the possibility of a successful effort. Thomas has given to this distressing symptom the elegant name "dyspareunia." "Penis captivus" has been known to result from an otherwise successful coitus.[1]

Treatment. Any discoverable local cause should be removed. A vulvar tampon of gauze saturated with a 4 per cent. solution of cocaine, kept in place ten minutes before the attempt, may lead to successful coitus, and therefore to utero-gestation and parturition. Maternity in most cases, though not in all, effects a cure.

Vulvar inflammation and erosion require the treatment described under Vulvo-vaginitis. Excision of the irritable caruncles and gradual or forcible dilatation of the vagina have in many cases given relief. The mere division of a rigid or imperforate hymen may be sufficient to remove the obstacle. Gradual dilatation is made by the introduction of graduated rectal bougies, to be worn an hour or more daily. Forcible dilatation requires ether, and should be followed by the continued wearing of a Sims vaginal plug. Meantime the patient

FIGURE 116.

Sims glass vaginal plug.

remains in bed until the divulsed vaginal walls have healed. The plug should be removed only during urination, defecation, and the giving of the vaginal douche; after healing it may be daily introduced by the patient in order to retain the effects of the divulsion. In obstinate cases divulsion will be inadequate. It is sometimes necessary to incise deeply at several points or to make two quite deep lateral incisions on either side near the posterior vulvar commissure. These incisions should completely divide the underlying muscles and their fascia; they may be closed by lines of union running at right angles to the directions in which the incisions were made, or until healing is established they may be kept open, as already described, by means of the vaginal plug.

Sims has advised coitus under anæsthesia for severe cases. Large doses of morphine, or local anæsthesia by means of cocaine, would perhaps serve a better purpose.

[1] Hildebrand, of Königsberg. Thomas and Mundé, Diseases of Women.

CHAPTER XIII.

METRITIS. INFLAMMATION OF THE UTERUS.

General Considerations.

THIS chapter should be read in connection with Chapter X., on the General Principles of Infection and Inflammation of the Pelvic Organs.

Inflammation, broadly defined as the reaction which living tissue exhibits to morbid irritation, may include a wide variety of lesions. These lesions, as related to the uterus, have been variously and sometimes vaguely designated as chronic metritis, subacute metritis, subinflammatory states, irritative states, and congestive states. This definition, however, is not intended to include neoplasms, although the division between these and inflammatory formations may at certain points be arbitrary.

Anatomy and Physiology. The study of metritis is the study of the anatomy and physiology of the uterus as modified by inflammation. A review of such parts of the anatomy and physiology as will aid in a description of these inflammatory processes will be useful.

The interior of the uterus is divided into two cavities, the cavity of the corpus and the cavity of the cervix. The former is protected from injurious influences from above by the two muscular constrictions which divide it from the Fallopian tubes; from below by a similar arrangement at the internal os. The cavity of the cervix is in a like manner protected from infection from above by the internal os; from below by the external os.

The Uterine Wall is made up of three layers: the mucous layer, called the endometrium; the muscular layer, called the myometrium; and the peritoneal layer, sometimes called the perimetrium.

The Endometrium is composed of lymphatics, bloodvessels, nerves, glands, and connective tissue, and is covered by a single layer of ciliated columnar epithelium. This epithelium also lines the uterine glands and is continued through the Fallopian tubes. The same variety of epithelium, modified, also lines the cavity of the cervix. Pavement epithelium covers the external vaginal portion of the cervix; it takes the pavement form at the external os.

The Glands of the Corpus Uteri are tubular, narrow, branching depressions. They dip down into and through the endometrium and penetrate to the muscularis. These tubular glands, penetrating everywhere throughout the endometrium, make up a very large part of its volume. They all open into the uterine cavity, sometimes two by a single orifice.

The corporeal endometrium is bound firmly to the inner layer of

the muscularis by connective tissue which is continuous with that of the myometrium.

The Lymph Spaces and Lymph Vessels of the uterus are abundant in the endometrium, in the muscular strata, and in the serosa. They

FIGURE 117.

Vertical section through uterine mucous membrane: *e*, columnar epithelium; *g*, uterine glands; *ct*, connective tissue surrounding glands; *vv*, bloodvessels; *mm*, submucous tissue. The glands are shown in both longitudinal and transverse section; semi-diagrammatic.[1]

lie in the interglandular spaces, surround the muscular bundles, communicate with a fine, lace-like network in the uterine serosa, and then,

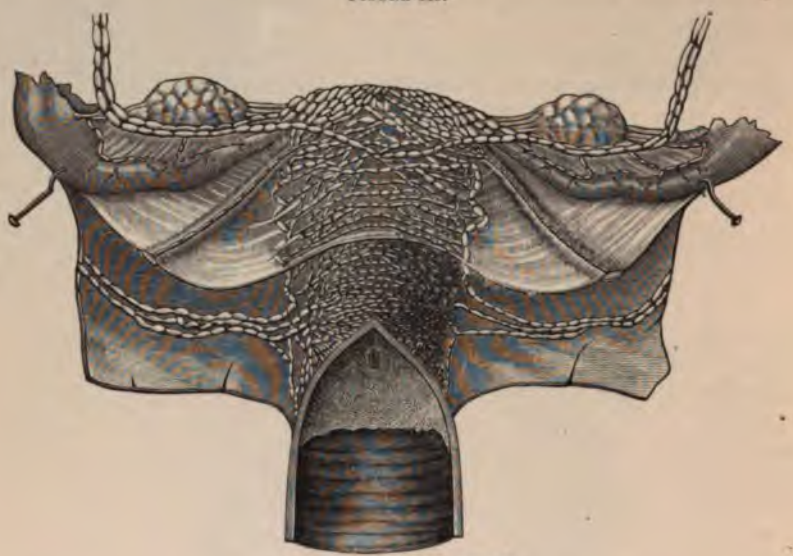
FIGURE 118.

Transition of squamous epithelium of vaginal portion to columnar epithelium of cervical canal.[2]

converging, pass by large channels outward through the broad ligaments. See Figure 119. The uterus is supplied richly with nerves,

[1] Turner: from American System of Gynecology. [2] From Abel.

FIGURE 119.



Lymphatics of the uterus.[1]

both spinal and sympathetic. The arteries and veins are described in the chapter on myomata.

The minute anatomy of the cervix differs from that of the corpus uteri in the following particulars. Its mucous surface has a peculiar

FIGURE 120.

Arbor vitæ arrangement of the cervical mucosa, magnified.[2]

[1] After Poirier, in Pozzi's Treatise on Gynecology.
[2] Mann. A System of Gynecology. From Playfair.

arbor vitæ appearance, as shown in Figure 120. The intra-cervical mucosa, like the corporeal, is lined with a single layer of ciliated columnar epithelial cells. These cells, modified to the shape of a cup, pass without cilia into the cervical glands. The epithelial cells are shorter, and the connective-tissue cells are closer together in the cervical than in the corporeal mucosa. The cervical mucosa, more dense than the corporeal, is bound less firmly to the muscularis by looser connective tissue; it does not participate in menstruation. An important function of the cervix is that of a sphincter to separate the corpus uteri from the vagina. The normal secretion of the uterine glands is alkaline, that of the corpus clear and watery, that of the cervix clear and viscid. A milky secretion is evidence of disease.

The essential function of the corporeal mucosa is the formation of the decidua and the nourishing of the embryo. The connective-tissue cells produce the cells of the decidua of pregnancy; this, with the progress of utero-gestation, matures, becomes over-ripe, degenerates, and, being of no further use, at term is cast off.

The most significant factor in metritis is the endometrium. It presents in the developmental and atrophic changes of puberty and the menopause, in the vascular changes of the menstrual ebb and flow, widely and constantly varying states. Inflammation of the uterus may occur during infancy, before the endometrium has matured; during puberty, when it is maturing; during maturity, when it has reached its full physiological significance; during the menopause, when it is undergoing degeneration; or during senility, when in the physiological sense it has forever disappeared. The occurrence of metritis under such diverse conditions partly explains the wide and variable range of its phenomena and the difficulty of description, and partly accounts for the confusion of classification and nomenclature which runs through the literature.

Classification.

The general subject, classification of infection and inflammation, has been discussed in Chapter X. The current classifications of metritis are numerous and faulty.

The Etiological Classification is based upon predisposing causes, such as parturition or traumatism, and upon the bacterial causes. The difficulty in identifying the causes and in differentiating between the many causes in a given case detracts from the value of the etiological classification as a clinical guide. A *bacteriological* classification may, under conditions of more exact knowledge, ultimately become a practical diagnostic, prognostic, and therapeutic guide. Already indications point strongly in this direction.

The Pathological Classification, so-called, into catarrhal, suppurative, granular, and ulcerative inflammations, is rather a designation of certain phases of the inflammatory process than a classification.

The Anatomical Classification includes endometritis (corporeal and cervical), myometritis, parametritis, and perimetritis. If these varieties usually occurred as distinct circumscribed lesions, instead of

complicating one another; if each could be known by its own peculiar symptom group; if ordinarily one could clinically be separated from the other—then the anatomical classification would not be, as it is, impractical and misleading. Endometritis, for example, cannot long continue without involvement of the myometrium, and *vice versa*. In either form there will be congestion and consequent increased secretion through the glands; the glandular structures will therefore be involved. General metritis includes the peritoneal covering of the uterus. There are no sharp clinical or pathological lines of demarcation between the anatomical divisions of uterine and peri-uterine infection.

To illustrate the hopelessness of the attempt to classify metritis, observe the following from an otherwise excellent modern treatise. This work classifies metritis into (1) acute inflammatory, (2) hemorrhagic, (3) catarrhal, (4) chronic painful. In the first division the word inflammatory is tautological. Any of the so-called varieties may be hemorrhagic, catarrhal, or painful. It is possible, therefore, to retain of this classification but two words—acute and chronic. The following paragraphs will still further show that any elaborate attempt at definite classification, even though diagrammatically attractive, is clinically impossible.

Nomenclature.

The nomenclature of the foregoing paragraphs, although not the outgrowth of adequate classification, is yet useful as a means of naming certain forms and phases of metritis. Such words as gonorrhœal, parenchymatous, and catarrhal are convenient for purposes of description. The name endometritis, for example, will be used to describe not a distinct lesion independent of the rest of the uterus, but rather an essential part of uterine infection. In this way we shall not lose sight of the clinical relations between the various forms and phases of metritis.

CHAPTER XIV.

ACUTE METRITIS.

When infection reaches the uterus, it usually attacks first the mucosa, and may then extend to the myometrium and perimetrium. Metritis is therefore a combination of endometritis, myometritis, and perimetritis. The storm-centre of the infection is usually the endometrium, and the essential lesion endometritis. It is impossible to preserve the autonomy of either one of these three factors of metritis, or to draw definite lines of division between them. The terms endometritis, myometritis, and perimetritis will be used not to describe separate and distinct lesions, but rather to identify the morbid changes that may occur in definite parts of an infected uterus.

Etiology.

The general subject of etiology has been outlined in the chapter on the General Principles of Pelvic Inflammations.

Predisposing Causes. Those influences that induce pelvic congestion are favoring conditions for metritis; they are:

1. Menstrual Congestion.
2. Suppression of the Menses.
3. Displacements.
4. Constriction and consequent obstruction in the uterine canal.
5. The so-called diatheses: lithæmia, cholæmia, anæmia, gout, and rheumatism.
6. The improper use of pessaries.
7. Parturition and abortion.
8. Traumatisms.
9. Excessive coitus.

These conditions and others like them were formerly supposed to be the essential causes. Now it is known that they contribute to the production of metritis as predisposing causes when supplemented by some other influence. This influence is the exciting cause, is usually at least bacterial and produced from without, seldom from within.

Exciting Causes. Among the exciting causes numerous bacteria and their products predominate. These bacteria have been partially discussed in the General Principles of Inflammation, Chapter X., and in the Etiology of Vulvo-vaginitis. They usually invade the cavity of the cervix uteri from below, intrench themselves in the cervical glands, and thence may be distributed directly by continuity of surface to the corporeal endometrium, the Fallopian tubes, ovaries, and pelvic peritoneum. Bacteria may also pass directly by the lym-

phatic or venous circulation from the cervix, vagina, rectum, or bladder to the ovaries and peritoneum. From these organs they may descend by continuity of the mucosa through the tubes to the endometrium.

The cavities of the cervix and corpus uteri, especially the latter, are normally free from pathogenic bacteria; they may, however, easily find access to these parts, and will then be active or inactive according to the presence or absence of predisposing causes; that is, according to the degree of resistance which the tissues exhibit to their presence. The corporeal and cervical mucosa, penetrated throughout with a great abundance of tubular glands, are especially adapted to incubate and distribute bacteria. This accounts for the tendency of metric and perimetric infection to become chronic.

The gonococcus of Neisser, since it has great power to penetrate the glandular elements and to intrench itself therein, is one of the most frequent and destructive causes of metritis. *The staphylococci of suppuration* are commonly found also in suppurative endometritis. *The streptococcus pyogenes*, generally admitted to be the germ of erysipelas, is very infectious and very fatal; infection from this germ does not usually spread by continuity of the mucosa, but rapidly follows the lymphatics and veins to the deeper structures—that is, to the uterine tubes, peritoneum, parametria, and ovaries—and produces one of the graver forms of puerperal and traumatic pelvic infection. The great danger of it is in the fact that it does not strongly attract leucocytes, and therefore does not excite defensive action. The *diphtheritic* and *tubercular* bacilli, the *bacilli coli communis*, and other bacteria may also be the exciting causes of metritis. The infection is often introduced from want of cleanliness during the puerperal state, from imperfect asepsis in parturition, in treatment, or in surgical operations. Direct infection through coition is very common.

During the three or four days after parturition and just before menstruation the physiological congestion of the uterus renders it most susceptible to infection. The cervical portion at all times is apt to be the habitat of pathogenic germs; such germs are often introduced by the physician's finger, or upon septic instruments, of which the unclean uterine sound is a striking example. The infectious material may be inactive, unless the soil is prepared to receive and develop it; but when the traumatisms of abortion and parturition, of accident and of surgery, have opened wide the door for bacterial invasion, infection will be the natural result.

Pathology.

The lymph channels bring into direct and close communication with one another the endometrium, myometrium, parametric cellular tissue, Fallopian tubes, peritoneum, and ovaries. The uterine mucosa now becomes both the starting-point and the distributing-point of the infection. The infected endometrium may readily and abundantly pour its poisonous products through the lymph stream, with resultant lymphangitis, myometritis, cellulitis, salpingitis, peritonitis, and ova-

ritis. Very significant is the fact that the lymph-spaces have no walls except the cellular tissue around them. This exposure of the cellular tissue may explain the susceptibility to infection of the uterine, para-uterine, and peri-uterine connective tissue. Infection may also be carried by the veins to all parts of the uterus and its surroundings in the same manner as by the lymph channels.

The disease may spread from the endometrium not only by the vessels, but also by continuity of mucosa to the Fallopian tubes, peritoneum, and ovaries, or may descend from these organs to the endometrium.

The swift and terrible march of the traumatic and puerperal infections to a destructive or even fatal result is partially explained by the close physiological and anatomical relations of the lymph stream to the endometrium and uterine peritoneum. See Figure 112. The irritants, usually streptococci or other pus cocci and their products, are taken up by the lymphatics or veins and widely distributed. They may be carried through the vessels without infecting them, or may infect them and produce lymphangitis, lymphadenitis, or phlebitis. The inflammation may be so intense as to destroy the vessels, or resolution may bring about complete recovery. Inflammation in the lymphatics or veins may result in lymph thrombosis or venous thrombosis. This is nature's way of limiting the spread of the infection. When recovery takes place, the lymph- or blood-stream is re-established around the obstructed parts of these vessels by collateral circulation. Perilymphangitis and periphlebitis may occur in the cellular tissue around the thrombosed lymphatics and veins. This process when it takes place in the parametria is pelvic cellulitis, a disease almost forgotten in these days of tubal and ovarian pathology. See Pelvic Cellulitis.

The anatomical changes may be summarized as follows:

1. Uterus enlarged, regular in outline, and of doughy or soft consistence.
2. Congestion extreme; there may be extravasation of blood in the muscularis.
3. Endometrium and perimetrium deeply reddened in circumscribed areas throughout.
4. Small-cell infiltration of interglandular and intermuscular connective tissue.
5. Engorgement of lymph-vessels.
6. Excessive secretion from the uterine glands.

The milder cases, chiefly characterized by engorgement, increased secretion, and pain, may subside in a few days, and the uterus may either become normal or lapse into a state of chronic metritis. In the more severe forms the disease may run a destructive course to the death or permanent disability of the patient. Its extent will vary with the virulence of the exciting cause and the resistance of the inflamed structures. Abscesses rarely develop in the myometrium except in connection with myomata. Inflammation of the mucosa may be catarrhal, suppurative, ulcerative, hemorrhagic, or all combined.

A grave form of acute disease has been described under the name diphtheritic or dissecting metritis.[1] The infection is usually puerperal, but is sometimes a sequel of non-puerperal diphtheria. It may be associated with gangrene of the vulva, and may occur after scarlet fever, typhoid fever, or cholera. In puerperal cases, says Garrigues, the diphtheritic infiltration may extend from the endometrium to the neighborhood of the peritoneum, cutting off a large part of the muscular layer, which after weeks or months will be expelled as a pear-shaped body. Dissecting metritis may be connected with similar disease of the vulva and vagina.

The ultimate changes in the uterine glands, uterine connective tissue and muscularis, and in the peritoneal covering of the uterus, are discussed elsewhere. See Chronic Endometritis, Myometritis, and Peritonitis.

Symptomatology.

The following tabular statement embraces the principal symptoms of acute metritis:

1. Elevation of temperature variable, sometimes preceded by a chill.
2. Pain, commonly confined to hypogastrium, may radiate to the back or thighs.
3. Painful defecation; rectal tenesmus.
4. Frequent and painful urination.
5. Nausea; vomiting and constipation not uncommon.
6. Menses suppressed or decreased; occasionally increased.

The symptoms of acute metritis depend upon the extent and gravity of the disease, and therefore may vary within wide limits from those of a mild infection to those of the greatest virulence. An apparently mild metritis may, however, result in the most destructive pelvic infection with all the results of grave peritonitis. The onset is usually marked by a chill, followed by variable high temperature and pulse; the pain is often intense. There is usually tenesmus of the rectum and bladder. Menstruation, if present, may suddenly cease, or the flow may increase. The menstrual fluid is mixed with the secretions of the inflamed glands. The congestion often passes off as menorrhagia comes on. This is nature's way of relieving the engorged vessels. The discharge, especially in the gonorrhœal form, may rapidly become purulent. When the inflamed uterus contracts to expel its abundant secretions the agony is that of exaggerated labor-pains. Bearing-down and heat in the pelvis are often excessive. When the disease has extended to the Fallopian tubes, pelvic connective tissue, ovaries, and especially when it invades the peritoneum, there will often be grave ptomaïne poisoning, with anxious facies, increased vomiting, and tympanites. Unless such infection is cut short by surgical measures the result may be rapidly fatal. The mode of death is usually by ptomaïne poisoning. See Perilymphangitis and Periphlebitis.

[1] Garrigues. Dissecting Metritis, New York Medical Journal, 1882, vol. xxxvi. p. 537; Diseases of Women.

Diagnosis.

The diagnosis is based upon the changes just described, which, if present, will determine the following *physical signs:*

1. Tenderness on pressure over the hypogastrium and in the vaginal fornix.
2. Abdominal walls tense.
3. Vagina dry and hot to the touch.
4. Pathological secretions from associated endometritis.
5. Uterus enlarged and softened.

Examination is often so painful as to be impracticable without anæsthesia. The corpus uteri is large and soft. The cervix is swollen; the os usually patulous, and often surrounded by erosion. The vagina is hot, and the arteries strongly pulsating. The urgent necessity is to watch for tubal and peritoneal extension. See Diagnosis of Salpingitis and Pelvic Peritonitis. The mere recognition of acute metritis is wholly inadequate. Unless the state of the uterine appendages and parametria is accurately made out, therapeutic indications of the greatest urgency may be overlooked; one should therefore in case of doubt insist upon examination under ether; as the case progresses repeated examinations may be necessary. In all acute inflammations of the genitals the use of the sound is strictly contraindicated.

Prognosis.

The prognosis of acute metritis is always disquieting, often grave. The disease may terminate in rapid resolution or in chronic metritis. Extension to the peritoneum involves immediate danger to life or remote danger to health. The relative virulence of different microbes has been discussed in the paragraphs on Etiology. Puerperal metritis is most liable to spread with the lymph stream, and is, especially when due to the streptococcus pyogenes, the gravest form; this form even when early recognized and promptly treated by radical surgery is apt to result fatally.

Treatment.

The treatment is prophylactic, abortive, palliative, expectant, and surgical.

Prophylaxis includes the avoidance or removal of the predisposing and exciting causes. Reference to the etiology will suggest the appropriate indications. Susceptibility is greater during the puerperal state, parturition, abortion, and menstruation. Extra care, therefore, at such times is essential. Especially forbid undue exposure of all kinds. Avoid the bacterial exciting causes by asepsis. Aseptic midwifery is imperative. The minor gynecological and obstetric examinations and manipulations without asepsis are dangerous. After an aseptic curettage, trachelorrhaphy, perineorrhaphy, or any other operation on the vaginal side of the pelvic floor, apply one large or two small ice-bags over the hypogastrium. The bag

must be in contact with the skin. The utility of it is destroyed by an intermediate dressing. In order to take up any water which might condense on the surface of the bag and run over the patient, the sides and top of the bag should be surrounded with absorbent cotton, and the ice should be held in place when the patient is on the side by a wide abdominal bandage. Above all, one should use every means to prevent the spread of a vulvo-vaginitis, especially if it be gonorrhœal, to the uterus. See Treatment of Vulvo-vaginitis.

The Abortive Treatment is applicable only in the onset, and includes such antiphlogistic measures as may cut short the attack during the stage of congestion. The disease once established must run its course. If the metritis be associated with menstruation or with suppression of that function, or with repeated chills, or with great prostration, use the hot-water bag in place of the ice. The flaxseed poultice is unclean, ineffective, and, unless renewed very often, does not hold the heat. A large blister over the hypogastrium may substitute or supplement the ice. Leeches are of great value if promptly and thoroughly applied. Use five or more over each inguinal region and five to the perineum—two or three are useless. A most essential thing is early and active catharsis by a mercurial purge, two grains of calomel or five of blue mass, repeated if necessary, and followed by Rochelle salt or some other saline. The administration of quinine in full doses, and of opium, has been followed by good results, but their value is questionable. The treatment is palliative and expectant in the milder cases, but may have to be energetic in the more virulent. In cases of metritis following plastic gynecological operations the sutures should be removed immediately and the denuded surfaces cauterized with pure carbolic acid.

The Palliative Treatment includes rest in bed, anodynes, especially the opiates, the hot or warm water vaginal douche—the hot-water bag, and the hot hip-pack. When the acute stage is subsiding there may be use for the glycerin and wool vaginal tamponade, Chapter IV. Later, iodine counter-irritation may be applied to the hypogastrium and vaginal fornix. Deep scarification through the speculum relieves the engorged vessels and may abort or palliate the attack. Let the cervix be pierced rather freely at several points by means of a fine-pointed bistoury or Buttles' spear-pointed lance. The oozing may be prolonged by tepid water or stopped by the hot-water douche, or, in a very vascular case, by the tampon. Should pain be intolerable, use a suppository of aqueous extract of opium, one grain, and extract of belladonna, one-sixth of a grain.

Expectant Treatment. The milder self-limited infections which have no grave systemic or local manifestations may be dismissed with palliative or expectant treatment. In grave infections it may be extremely difficult or impossible to choose wisely between the danger of the disease and the extra peril of surgical interference; hence, even in serious cases, the expectant course may have to be considered.

Surgical Treatment. When the systemic condition is grave and the nervous system indicates profound ptomaïne poisoning, the disease under any treatment will in a large proportion of cases terminate

fatally. A number of practical and momentous questions at once arise:

Question 1. Is there simple absorption into the circulation from some focus of decomposition in the uterus? Is the toxæmia due to the products of a decomposing foreign body, such as a blood-clot, a fragment of placenta, retained membrane, or pent-up lochia? In other words, is it due to the absorbed products of putrefactive bacteria? To put the question in a more concise form, Is it sapræmia? If the answer be in the affirmative, the indication is clear and imperative to remove the putrefying mass, wash out the endometrium, and establish drainage. The offending mass may be removed with the finger, the placental forceps, or, if necessary, with the dull curette. Sharp curettage, powerful cauterization, and all other severe surgical measures in this connection are unnecessary, dangerous, and forbidden.

Question 2. Is the uterine mucosa the seat of an infection, and as such is it the distributing point of bacteria which may spread and infect the uterine appendanges and peritoneum? If the bacterial invasion has extended beyond the uterus, to what extent are the uterine appendages and peritoneum invaded? Is the systemic disturbance such as to suggest that the bacteria and their products are very liable to enter the general circulation in quantities sufficient to give rise to pronounced septicæmia?

Question 3. Have pus emboli been carried through the circulation from one focus of suppuration to set up other foci in different parts of the body, and thereby produce metastatic abscesses? To put the question in another form, Is there or is there likely to be pyæmia?

If the answers to the second and third queries are in the affirmative, it becomes essential to decide whether the infection has spread so far beyond the uterus as to make the metritis relatively insignificant. Clearly, if there are metastatic abscesses, or if even infection has spread to the other pelvic organs, surgical treatment of the intra-uterine infection alone would be useless and might add to the danger. Abdominal or vaginal section and the drainage of the abscesses, or even the removal of the uterus and its appendages, would then have to be considered.

The milder cases, as already stated, may be safely left to palliative and expectant treatment. The graver infections unfortunately have in the majority of cases passéd beyond the range of intra-uterine therapeutics before the question of operative interference is forced upon the surgeon. We may, however, be concerned with the question, What surgical measures, if any, are justifiable in the effort to prevent the further spread of dangerous acute uterine infection which is still nearly or quite confined to the uterus?

The method of dilatation, curettage, and drainage of the endometrium has now to be considered. In this consideration let us not lose sight of the purpose of these procedures: it is to cut short the uterine infection and to prevent its extension; or, if already in a degree extended, to limit its force by withdrawing the toxic supply. Partial, inefficient curettage, which opens up and exposes fresh lymphatics and veins, but does not remove all the infected mucosa, will prepare the

way for further infection, which may be more virulent and more sweeping than the first; as tersely stated by De Lee, such a procedure is like raking over a patch of lawn after scattering seed over it—a veritable insemination. It is evident, therefore, that curettage, if indicated at all, should be thorough; should, indeed, stop at nothing short of the removal of the entire infected mucosa. The sharp curette, which has generally been considered a more dangerous instrument than the dull one, is then less dangerous. The operations reported by Pryor, Krug, and others, indeed prove that the sharp curette in careful hands is much less dangerous than has been supposed. The thorough application of it in selected cases has, according to reliable report, been followed by prompt decrease in the ptomaïne poisoning and in the other grave symptoms. The opponents of the operation declare, not without reason, however, that most of the recoveries would have occurred without it, and that many of the failures have occurred in consequence of it.

If the infected endometrium has become soft, spongy, friable, and macerated, and if it is decided that its thorough removal will lessen the danger of the extension of the infection, the steps of the operation will be as follows:

1. Anæsthesia.
2. Preparation of the vagina and external genitalia as directed for minor operations in Chapter II.
3. Dilatation of the uterus, unless it is already sufficiently open.
4. Removal of the infected endometrium by means of the sharp curette; see Curettage, Chapter V.
5. Thorough irrigation of the endometrium with hot sterilized water.
6. Thorough mopping out of the endometrium with cotton wound on dressing-forceps, and dipped in a saturated solution of iodine crystals with pure carbolic acid.
7. Placing of an antiseptic dressing over the vulva.

Some operators omit the iodine and carbolic-acid applications and rely upon the thoroughness of the curettage to remove all infectious matter. An advantage, however, in the use of this powerful disinfectant lies in the fact that it insures thorough disinfection of any infected shreds which may have escaped the curette, and that by its cauterizing effect it so shuts the mouths of the freshly opened lymph-vessels and bloodvessels that further absorption through them is less likely to occur.

It is the custom of many excellent operators to tampon the endometrium lightly with a continuous strip of antiseptic gauze, and to fill the vagina with another strip somewhat wider; after twenty-four hours they remove the gauze, repeat the intra-uterine irrigation, and introduce fresh gauze. Anæsthesia is now not usually required. Before the introduction of the gauze it is well to make a thorough intra-uterine application of creolin or of a 25 per cent. solution of ichthyolate of ammonium in glycerin. It is a mistake to saturate the gauze with such medicinal substances, because they interfere with its chief function—capillary drainage. Iodoform and sublimated gauze have

caused dangerous poisoning, and are therefore not approved. If the grave symptoms have subsided, the gauze may be removed at the end of twenty-four hours and need not be renewed. In very infectious cases some operators renew the gauze and irrigate with dioxide of hydrogen daily until the uterine secretions become normal. See Treatment of Chronic Endometritis, Chapter XVII., for a further discussion of intra-uterine curettage and drainage.

The operation given above is less dangerous and more rational than the meddlesome half-way measures of intra-uterine medication and irrigation of the undilated septic uterus. The judicious selection of cases is manifestly a matter of great difficulty. If proper selection can be made, the operation in careful hands may be permissible and useful.

In puerperal infections, especially in streptococcus infections, the toxins are apt to be specially deficient in their power to attract leucocytes—that is, to build up a limiting wall around the infected centre and thereby to protect the general system against invasion. For this reason the puerperal infections, especially if of the streptococcus variety, are said to offer a relatively strong indication for early interference. But the streptococcus germ may reach the uterus in an hour; in two or three hours more it may have passed far beyond the uterus, where the curette cannot reach, much less remove it.

Future bacteriological researches may open the way for an etiological classification that will furnish a safe and definite guide to the therapeutic indications. Work in this direction thus far, however, gives little promise of immediate practical results. In this connection we may add that serum therapy is undeveloped, and therefore, in a practical sense, is not yet very pertinent to the subject.

The writer's personal conviction on the value of dilatation, curettage, and drainage of the endometrium in acute infection is that the measure should be limited in its application. Let no man be lured to the performance of this dangerous operation in an acute case because of the ease, safety, and efficacy of the same procedure in chronic endometritis. The only cases in which it should be performed are those which will otherwise result in dangerous spreading of the infection.

Clearly curettage is contraindicated in the numerous and grave cases in which the infection has passed to the parametria, not from the endometrium, but by the lymph vessels or bloodvessels.

All admit the practical difficulty, not to say impossibility, of selection so as to limit the operation to those infections which are really dangerous, and still confined to the uterus. It is, moreover, a practical question whether the course of grave puerperal, gonorrhœal, or traumatic infection is often arrested by the procedure. At the same time few will deny that the operation has repeatedly given rise to fatal results. On the other hand, expectancy and palliation will often be rewarded by the subsidence of grave symptoms and final recovery. One cannot too strongly urge in all grave and doubtful cases an examination, or, if necessary, repeated examinations under anæsthesia; see Diagnosis and Prognosis.

There can be for a surgeon no greater cause of regret than the fact

that he has exhausted the resisting forces of his patient by a dangerous half-way measure which itself may have contributed to the necessity for a more radical operation, and that while with the promise of such a measure he has been lulling himself into a sense of false security the infection has gained irresistible force. If urgent indications, arise the best hope of recovery may be in abdominal or vaginal section and drainage, or the removal of the infected uterus together with its appendages These operations, if indicated at all, are made necessary by the rapid spread of the infective process and therefore become at once imperative. Until the necessity for such extreme measures becomes apparent, there is at least virtue in the attitude of watchful expectancy. See Vaginal Incision and Drainage, in Chapter XXIII.

CHAPTER XV.

CHRONIC ENDOCERVICITIS.

THE synonyms of endocervicitis are cervical catarrh and cervical endometritis. Since the endometrium is situated entirely above the internal os, there is a manifest impropriety in using the word endometritis in connection with the cervix uteri.

In studying this subject the reader should constantly have in mind the physiological and pathological unity of the reproductive organs. Infection is seldom confined to a single part of the uterus; on the contrary, it usually extends to other parts and commonly spreads to adjacent organs. We are considering nothing less than the whole subject of metritis, but with special reference to the cervical mucosa.

The single layer of columnar epithelium, the underlying connective tissue, the lymph-spaces, the lymphatics, the veins, the arteries, and the nerves which make up the intra-cervical mucosa, are subject to certain chronic changes that pass under the name chronic endocervicitis. Similar disease of the corporeal mucosa is called chronic endometritis.

Etiology of Endocervicitis.

Endocervicitis, often called cervical endometritis, is inflammation of the cervical mucosa. The predisposing systemic and local causes and the bacterial exciting causes have been pointed out in Chapter X.

The disease is in some respects like, in others unlike, corporeal endometritis. It often occurs by extension from vulvo-vaginitis. It rarely descends from the corpus. It may have been carried as a primary infection, without intermediate infection of the vulva or vagina, direct to the cervical mucosa. As in the corpus uteri, it may involve not only the mucosa, but also the submucosa and muscularis.

Although the normal endometrium is free from pathogenic bacteria, the cervical cavity is quite accessible to them. This explains the greater tendency of the cervix at all times, especially upon slight traumatisms, to become infected. The cervical glands, well adapted to receive, retain, and distribute infection, easily become a culture-ground for bacteria. Once intrenched in the gland-crypts, the germs may remain attenuated and relatively quiescent for long periods, and then may develop new cultures and spread. Among the more frequent causes of endocervicitis are the following:

1. Extension of infection from the vulva, vagina, or endometrium, especially infection of gonorrhœal origin.

2. Puerperal laceration of the cervix.
3. Excessive coitus.
4. Foreign bodies, tumors, polypi.
5. Infection from unclean instruments and fingers.

Pathology of Endocervicitis.

The pathological sequence of a seemingly insignificant infection of the cervix uteri, especially if acute, may be either by continuity of surface to endometritis, salpingitis, peritonitis, and ovaritis; or by the pelvic lymphatics and veins to pelvic lymphangitis, phlebitis, peritonitis, and ovaritis: thus acute infection seldom is confined to the cervix, but is apt to involve the other parts of the uterus. The corpus uteri and adjacent organs are more likely to be involved if the chronic cervicitis has followed an acute inflammation; less likely if it was chronic from the beginning.

The swollen mucosa, especially if the cervix be lacerated, takes the direction of least resistance, and may protrude through the os externum. The thickened everted mucous membrane may give to

FIGURE 121.

Mucous polypi of the cervix uteri, follicular hypertrophy.[1]

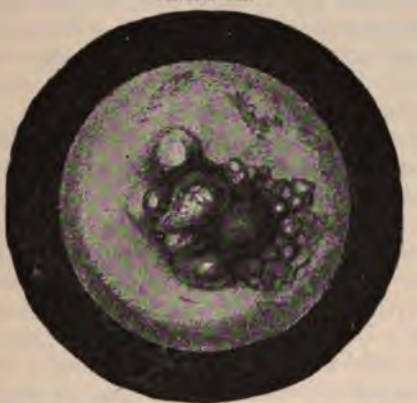
the cervix the appearance of great enlargement. The condition is not unlike that of the prolapsed hemorrhoidal anus. The engorged open cervical glands in great numbers pour out their secretion upon the vulvo-vaginal surface. The discharge, unlike that of endometritis,

[1] From Thomas and Mundé.

is thick, ropy, viscid, abundant, and gelatinous. It may only with difficulty be dislodged from its anchorage in the cervical glands.

In nullipara the internal and external ora are sometimes so constricted as to cause retention of the cervical secretions and consequent dilatation of the cervical cavity. See Figures 127, 128, and 129.

FIGURE 122.



Mucous polypi at the os uteri externum.[1]

The chief pathological factors are erosion of epithelium and glandular enlargement. In this respect endocervicitis offers a close analogy to corporeal endometritis.

Erosion of the Cervical Epithelium. Erosion of the cervix is characterized by a red or purple livid color, is confined usually to the area immediately around the external os uteri, and not infrequently extends over the entire vaginal portion of the cervix; it has the appearance of ulceration, and in the older literature was so called. The affected area, as first demonstrated microscopically by Ruge and Veit, is covered by a layer of newly formed inflamed columnar epithelium. The epithelium is not destroyed as in ulceration, but is simply eroded, and forms a *mucous patch.* Ulcerative processes—localized necrosis—have nothing in common with this condition; ulceration is the destruction of the superficial epithelium and inflammatory involvement of the underlying tissue, and as compared with erosion is very rare. Two varieties of erosion of the cervix have been described:

1. Simple Erosion.
2. Papillary Erosion—cock's-comb granulations.

1. Simple Erosion, which answers to the description given in the preceding paragraph, presents a smooth, uniform, velvety surface, with little or no formation of new glands, and, although having the appearance of ulceration, shows, on microscopic examination, the characteristic non-specific mucous patches covered by a single layer of newly formed columnar epithelium.

2. Papillary Erosion. This form of erosion, from its livid red

[1] Thomas and Mundé.

color and characteristic projections, has been called cock's-comb granulation. The irregularity of surface is due (*a*) to newly formed glands; (*b*) to hyperplasia of the connective tissue beneath the surface epithelium and the glands; (*c*) to elevations of the interglandular surfaces. The surface, as in simple erosion, is covered by a single layer of columnar epithelium. The papillary projections, in gross appearance, closely resemble cancer, but, unlike that disease, are non-friable and have little disposition to bleed on handling. There is abundant small round-cell infiltration of the connective tissue and free secretion of mucus.

Glandular Enlargement occurs in two forms:

1. Polypoid glandular enlargement—mucous polypi.
2. Cystic glandular enlargement—Cystic Degeneration—sometimes called follicular erosion, sometimes ovula Nabothi.

1. *The Polypoid Glandular Enlargement* produces diminutive mucous polypi, smaller, of different origin, and softer than fibrous polypi. The genesis of mucous polypi is as follows: The enlarged glands protrude upon the surface; their mouths become obliterated; the glandular tissue is œdematous from retained secretions; the bases constrict and the little masses become polypoid; they correspond to the so-called adenoids of nasal pathology. A similar development sometimes occurs in the endometrium as the result of endometritis. These mucous polypi are by some pathologists classified as benign adenoma. The more modern tendency is to consider them the result of inflammation.

2. *Cystic Glandular Enlargement*—Follicular Erosion. Very often as the result of erosion the openings of the cervical glands become occluded by adhesive inflammation, so that the glands are distended by their own secretions. This process, known as *cystic degeneration*, results in the formation of numerous round submucous bodies, sometimes called ovula Nabothi, but more commonly known as follicular cysts or retention cysts; they may be present in any number, from one to several hundred; they are hard, tense, spheroidal bodies, varying in size from that of a millet-seed to that of a pigeon's egg; and on digital touch feel like shot under the skin. Seen through the speculum, they appear as rounded elevations of yellow, blue, or gray color; they contain inspissated mucus, which sometimes is infected by pus micro-organisms, forming small circumscribed abscesses. These cysts when small are lined with the typical gland epithelium of the cervix, but as they become distended the epithelium flattens and finally disappears through pressure atrophy. Cystic degeneration, according to Emmet, is a cause of numerous reflex nervous disturbances; it is rarely seen on the nulliparous cervix, but is a frequent result of laceration, and as such will be further described in the chapter on that subject.

Symptoms of Endocervicitis.

Endocervicitis may cause no symptoms. The symptoms associated with it may be due to complications, and may therefore have little or

no diagnostic value; among them are disordered menstruation, sterility, pain in the back, a sense of weight in the pelvis, and functional disturbances of extra-pelvic organs, especially the organs of digestion.

Diagnosis of Endocervicitis.

The diagnosis is simplified by the accessibility of the diseased structures, especially when the inflamed swollen mucosa is rolled out in contact with the vagina and when the erosion extends out over the external os; it must depend upon the physical signs, upon microscopic examination of tissues, and upon examination of the secretions.

Digital and Sight Examination. Lacerations and cystic glandular enlargement are better examined by digital touch than by sight. Erosions and mucous polypi are soft and elusive, and are therefore better seen than felt.

Speculum Examination. The speculum, Sims' speculum preferred, will disclose some or all of the following conditions if they exist outside the external os:

1. Margins and scars of lacerations.
2. Retention cysts—rounded yellowish or bluish projections.
3. Mucous polypi, protruding from the external os.
4. Erosions, as described under pathology.
5. External os filled with a plug of tenacious mucus.
6. Ulcerations, which are rarely seen except those of malignant, tubercular, or cancerous origin.

Examination of Secretions. The secretion is always abundant, and viscid, and is usually clear, but may be murky from the admixture of epithelium and leucocytes; it may also be yellow or greenish yellow from the presence of pus, or red from streaks of blood.

To obtain secretions for bacteriological examination for gonococci, tubercle bacilli, or other organisms, the method of Schultze may be employed, as follows:

1. Sterilize the vagina with douches.
2. Place a sterile cotton tampon against the cervix uteri.
3. On the day following remove the tampon, collect the secretions with a swab, and examine immediately.

The early differential diagnosis of erosions, both simple and papillary, from carcinoma is most important. Friability and bleeding upon handling with fingers or instruments are the two most reliable clinical signs of carcinoma as distinguished from erosions. The symptoms are not to be relied upon, because erosions may give all of the typical signs of carcinoma, and carcinoma may give rise to few or no signs. For an absolute diagnosis a microscopic examination should be made of an excised part of the suspected growth. See Differential Diagnosis in Chapter XXVIII. on Carcinoma Uteri, and in Chapter XVI. on Chronic Endometritis.

Ulceration of the Cervix. The following varieties of ulcer are recognized:

1. Decubitus ulcer, caused by ill-fitting pessaries and friction, as in procidentia uteri.

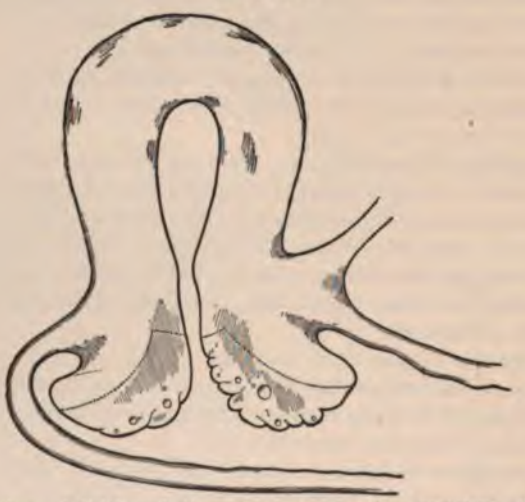
2. Tubercular ulcer.
3. Chancre and chancroid.
4. Carcinomatous ulcer.

As compared with erosion and glandular enlargement, ulceration is rare. The causes, pathology, and diagnosis are the same as for similar conditions in other parts of the body.

Treatment of Endocervicitis.

In the treatment of cervicitis it is well to remember the physiological fact that irritation to the opening of a duct will stimulate and increase the secretion of the gland or glands from which the duct leads; and, conversely, the withdrawal of the irritation will cause a decrease in the secretion. The same is pathologically true of the uterus. Its canal is a duct leading from the uterine glands. The irritation of endocervicitis, therefore, may increase uterine secretions. It follows that whatever will allay irritation in the cervix must tend to relieve the excessive glandular activity.

FIGURE 123.



Schröder's operation. A thickened diseased cervix requiring resection. The dotted lines show where the incisions should be made.

In acute or recent endocervicitis the treatment, especially if the infection be gonorrhœal, should be strongly disinfectant. The purpose is to prevent extension to the corpus uteri and parametria. First clean out the mucous plug, then thoroughly apply a saturated solution of iodine in 95 per cent. carbolic acid over the whole intra-cervical mucosa. The strong tendency of the infection to spread, and the consequent danger of the disease being carried to the corporeal endometrium by the careless introduction of instruments past the internal os, should be kept constantly in mind.

When the chronic disease process has penetrated to the deep mucous

folds and glandular pockets, superficial treatment will fail. It then becomes necessary to destroy the infected mucosa. Deeply-acting caustics may accomplish this, but the resulting cicatricial contraction, especially when the canal is not very patulous, contraindicates their use. The same objection in less degree applies to the removal of the mucosa by sharp curettage. Thorough excision and covering the surfaces thereby exposed by a plastic operation is usually the best treatment. The operation of Schröder[1] fulfils this indication. It is performed as follows:

FIGURE 124.

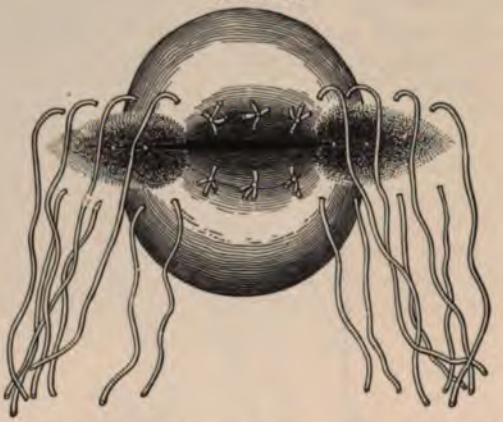
Schröder's operation. Diseased tissues excised. Sutures in place for the union of the vaginal to the intra-uterine margins of the wound, but not yet tied.

Schroder's Operation. The patient being under ether and in Sims's lateroprone position, the cervix exposed by Sims's speculum is drawn toward the vulva and divided bilaterally with scissors to or beyond the utero-vaginal junction. The anterior and posterior lips are then widely separated with tenacula. The condition is now like that of extensive bilateral laceration of the cervix. The lateral incision should be deep enough, so that when the lips are forced apart all the diseased intra-cervical mucosa may be exposed and excised. The anterior and posterior flaps are now turned in and united with sutures to the intra-cervical margins of the wound. Two or three sutures are required to secure each flap. The lateral incisions, now much shortened by the folding in of the flaps, may after suitable denudation be closed by suture, as in Emmet's operation for laceration of the cervix. Upon completion of the operation the flap sutures will be situated deep in the cervical canal, where removal of them would be difficult. They should therefore be of catgut. The lateral sutures should be of silkworm-gut or fine formaldehyde catgut. If silkworm-gut, they should be removed in about two weeks. The operation, if well done, is followed by permanent cure and freedom from stenosis.

[1] Handbuch der Krankheiten der weiblichen Geschlechtsorgane.

Great eversion through the os externum, giving the outrolled mucosa an ulcerated appearance, is due usually to laceration of the cervix, and should be treated as such. See Emmet's Operation. In rare cases pronounced eversion and erosion occur in the virgin cervix, giving rise

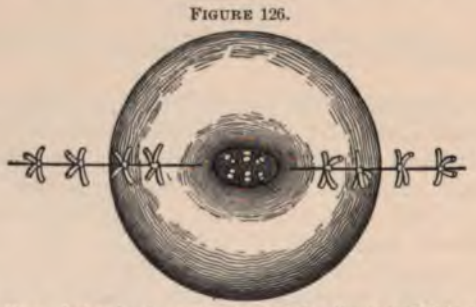
FIGURE 125.



Schröder's operation. Vaginal margins sutured to the intra-uterine margins of the wound. Lateral surfaces denuded and sutures passed, but not yet tied.

to soft, spongy, granular masses, which should be removed with the curved scissors, the cut surfaces cauterized, and the cervix dressed with strips of gauze saturated with a mixture of 10 per cent. ammoniated ichthyol in glycerin ; the dressings to be changed daily until the surfaces

FIGURE 126.



Schröder's operation. Lateral sutures introduced for the completion of the operation, and tied. The white dots in the os externum represent the ends of the protruding sutures, which are now rolled far into the cervical canal.

have healed. This treatment will be disappointing if there be extensive endometritis above, unless that also be included in the plan of treatment. See Treatment of Endometritis. It will, however, be wholly satisfactory if the inflammation is confined essentially to the lower cervical mucosa.

Polypoid endocervicitis, so called, requires the removal of the adenoid growths by means of the sharp curette or the scissors. When glandular disease is extensive, it may be necessary to perform Schrö-

der's operation. The cystic form of glandular enlargement rarely occurs in the nulliparous woman. The condition and treatment thereof are described under Lacerations of the Cervix. Schröder's operation is usually indicated.

FIGURE 127.

Pinhole os.[1]

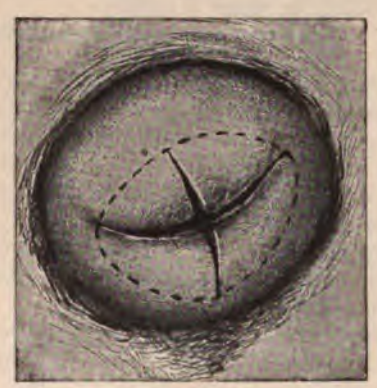
In nulliparæ the internal and external ora are sometimes so narrow that the cervical secretions are retained and distend the cervical cavity quite beyond its normal size. Sometimes the internal os is open, and the corpus is correspondingly enlarged from the same cause. The retained secretions give rise to great irritation and reflex disturbances. The rational treatment is to open the canal by free incision of the external os, and, if necessary, by dilatation of the internal os. Exploratory curettage will show whether the endometrium requires thorough dilatation, therapeutic curettage, and cauterization. In order to prevent the external os from closing again a plastic operation should be made to keep it open. Schröder's operation, already described, will suffice for this purpose; or the incision may be made very free and during the healing process kept wide open by means of gauze-packing. See Figures 128 and 129.

FIGURE 128.

Canal dilated by uterine secretions from obstruction at os externum. Lines on either side of os externum indicate depth of proposed incisions.[2]

The pinhole os is usually congenital and chiefly confined to nulliparæ. It may, however, occur as the result of caustics or of too tight closure in the

FIGURE 129.



Crucial incisions in Fritche's operation.[3]

operation for laceration of the cervix uteri. The constricted external os may be opened by Fritche's operation, as shown in Figure 129, or by forcible dilatation. After the application of either of these methods the os is liable to recontract. Schröder's operation, which gives permanent results, is therefore preferable.

[1] From System of Gynecology by American Authors. [2] Ibid.
[3] From Thomas and Mundé's Diseases of Women.

CHAPTER XVI.

CHRONIC ENDOMETRITIS.

In studying endometritis, one should remember that the infected endometrium is usually only a part of an infected uterus, and that this infection in many cases is not limited to the uterus, but in variable degree may involve the uterine appendages and parametria.

The layer of columnar ciliated epithelium, the connective tissue, the blood- and lymph-vessels, and the nerves which compose the endometrium, are, like the similar structures in the cervix, subject to chronic infection. Certain pathological changes result from this infection, and are the essential factors of chronic endometritis.

Etiology of Chronic Endometritis.

The predisposing and exciting causes are the same as already described for acute metritis. The most usual source of the infection is from the cervical mucosa.

Pathology of Chronic Endometritis.

It is here important to remember that not every increased secretion is proof of endometritis. There may be an effort on the part of the mucosa to relieve, by an increased secretion, a chronic venous congestion in and about the uterus; or the mucous membrane of the uterus in common with that of other organs may be engaged in vicarious elimination of effete matter which the proper excretory organs have failed to eliminate: such conditions strongly predispose to and are present in a large proportion of cases of endometritis, but are not in themselves endometritis.

In studying endometritis microscopically the beginner may be at a loss to account for occasional irregular appearances of the uterine glands, due to invagination of the glands. Figures 130 to 137 will explain these irregularities.

The general pathology has already been forecast under acute metritis. The special pathology will be presented in the description of the different histological and clinical forms.

Classification of Chronic Endometritis.

The general divisions of chronic endometritis are: 1. Histological. 2. Clinical.

FIGURE 130.

FIGURE 131.

FIGURE 132.

FIGURE 133.

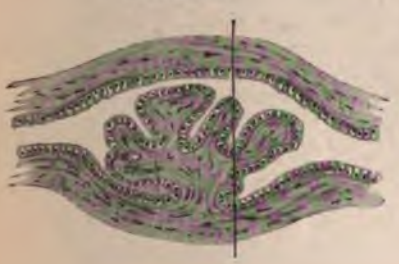


FIGURE 134.

FIGURE 135.

FIGURE 136.

FIGURE 137.

FIGURES 130–137.

Explanation of scheme of gland invagination. Figures 130 to 133 show longitudinal sections of invaginated uterine glands; Figures 134 to 137 show cross-sections of the same gland. The glands shown in longitudinal section are crossed each by a line showing the plane at which the cross-sections are made. Figure 130 shows invaginated the fundus of a gland with secondary eversion, Figure 133 shows intraglandular papillary invagination of a gland epithelium from the side of the gland. Figure 131 shows simple invagination of the fundus of a gland. Figure 132 shows the inner and outer segments regular and the middle segment invaginated.[1]

[1] Amann. Mikroskopisch-Gynäkologischen Diagnostik.

Histological Forms of Chronic Endometritis.

The histological forms of endometritis are:

1. Glandular Endometritis { Hypertrophic Glandular Endometritis. / Hyperplastic Glandular Endometritis.
2. Interstitial Endometritis.
3. Glandular and Interstitial Endometritis—mixed form.

1. *Glandular Endometritis.*

Glandular Endometritis is characterized by increase in the size or in the size and number of the glands, and accordingly is subdivided into: *a. Hypertrophic Glandular Endometritis; b. Hyperplastic Glandular Endometritis.*

a. Hypertrophic Glandular Endometritis. The normal uterine glands are tubular, approximately straight, branch but little, run almost perpendicular to the surface, may extend to the muscularis—

FIGURE 138.

Hypertrophic glandular endometritis, cross-section of glands. *a.* Single invagination of a gland, showing two lumina. *b.* Double invagination, showing three lumina. *c.* Irregular invagination of epithelium.

that is, to the myometrium; and but rarely dip down so far as to penetrate even to the superficial layer of it. In hypertrophic endometritis, the glands increase in size, become proportionately irregular in outline, pursue a direction less perpendicular to the surface, dip more

[1] Amann. Mikroskopisch-Gynäkologischen Diagnostik.

deeply, develop numerous branches, become tortuous; and in consequence of dilatation in some places and constriction in others, frequently take on great irregularity of lumen. There is always a single, and only a single layer of columnar epithelium, with enlargement of the individual epithelium cells. Such is the picture of chronic hypertrophic glandular endometritis.

b. Hyperplastic Glandular Endometritis. This form of endometritis not infrequently presents all the essentials of the hypertrophic variety, but, as a distinguishing characteristic, will show increase in the number of glands; this increase necessarily takes place at the expense of the interglandular connective tissue, so that the interglandular spaces no longer maintain the normal ratio of four times the diameter of the glands; but may, on the contrary, almost wholly give way to the encroachments of the newly formed glands. Increase in the number of glands results from a process of budding of the glands or of invagination from the surface epithelium.

The hyperplastic form of endometritis is regarded by some pathologists as a new growth, and is sometimes called *benign adenoma*. The consensus of opinion, however, is in favor of attributing to such growths an inflammatory origin, and of placing them in an intermediate position between inflammatory growths and new formations. In this work the term *adenoma* will not be used to describe hyperplastic endometritis, but will be reserved for the malignant glandular growths.

2. *Interstitial Endometritis.*

Interstitial endometritis is characterized by an increase in the connective tissue of the endometrium at the expense of the glandular elements and is therefore the reverse of the hyperplastic glandular forms. In the normal endometrium the connective tissue is embryonal in type and composed of spindle cells loosely associated. In interstitial endometritis these cells increase and mature into fibres which separate the glands widely. The effect of these connective-tissue changes is to shut off the nutrition of the glands, and thereby to crush out and partially or completely to destroy them. The outlets of the glands may close and give rise to retention cysts; this is called cystic endometritis. Finally, the endometrium may become a thin layer of contracted cicatricial tissue, not unlike that produced by the atrophic changes of old age.

3. *Glandular and Interstitial Endometritis.*

Glandular and interstitial endometritis are often combined in varying proportions. Part or all of the endometrium may be involved.

Mucous Polyps of the uterus, commonly called *polypoid endometritis*, are to be regarded as of inflammatory origin; they are found both in interstitial and in glandular endometritis, and are apt to be developed where there is a concurrence of interstitial endometritis with great glandular enlargement; they are marked by excessive, diffuse, glandular and vascular development and by cystic degeneration of the

glands. Some of the cystic glands have the character already described under interstitial endometritis ; others become fungoid pro-

FIGURE 139.

Polypoid endometritis. *p, p, p.* Mucous polypi. *u.* Uterus. *v.* Vagina.[1]

jections upon the surface—that is, small, soft, polypoid bodies, like nasal polypi ; often pedunculated, variable in size, and œdematous from

FIGURE 140.

Hyperplastic glandular endometritis ; longitudinal section of glands. Glands much elongated, tortuous, and reaching to the muscularis.[2]

retained secretions. These changes make the endometrium excessively thick, soft, and œdematous. The excessive glandular and vascular enlargement explains the chief subjective symptoms—exhaustive glandular secretions and hemorrhage. These polypoid bodies

[1] De Sinety. [2] Amann. Mikroskopisch-Gynäkologischen Diagnostik.

are not to be regarded as new growths, and therefore should not be classed as adenomata.

FIGURE 141.

Glands of normal mucosa. Transverse section. Semi-diagrammatic.

FIGURE 142.

Mucosa modified by interstitial endometritis. Connective tissue increased. Glands crushed out or changed to retention cysts. Semi-diagrammatic.

Clinical Forms of Chronic Endometritis.

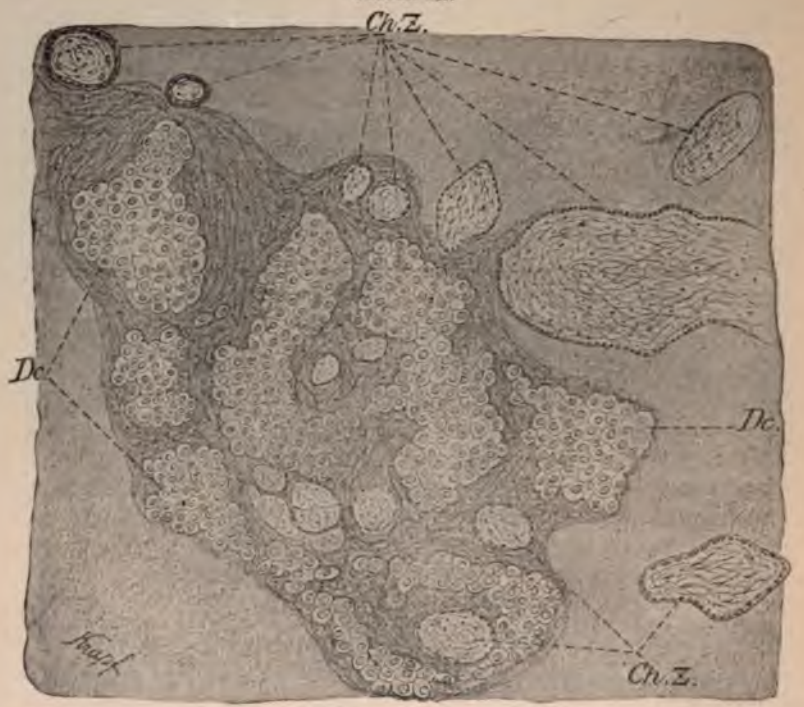
The clinical varieties of endometritis may usually be referred to one or both of the histological forms. The individual peculiarities are dependent upon intercurrent conditions. The clinical forms are:

1. Post-abortum endometritis.
2. Exfoliative endometritis.
3. Senile endometritis.
4. Tubercular endometritis.
5. Decidual endometritis.
6. Septic endometritis, so-called.

1. *Post-abortum Endometritis.* Abortion may be a cause or an effect of endometritis; in either case the disease may present certain peculiarities. The inflammation, which is rather interstitial than glandular, causes an arrest of involution in the mucous membrane at the site of the ovule and of the adjacent mucosa—*i. e.*, of the decidua serotina and decidua vera. The arrest of involution may be only in places; this gives rise to islands of decidual cells circumscribed within the surrounding mucous membrane by the round cells of inflammatory tissue.

2. *Exfoliative Endometritis*, called membranous dysmenorrhœa, is characterized by the detachment of the outer layer of the endometrium in pieces or as a whole, and the expulsion of it from the uterus. It may occur at puberty, with the first menstruation, and continue indefinitely, or may commence at any time during menstrual life. Nulliparæ and multiparæ are both subject to it. The character, quantity, and completeness of the thrown-off membrane vary with individuals, and from time to time in the same individual. The microscopic resemblance between the exfoliated membrane and the

FIGURE 143.



Post-abortum endometritis. Section of endometrium removed by the curette a long time after abortion, showing decidual cells and chorionic villi. *Dc.*, decidual cells; *Ch. Z.*, chorionic villi.[1]

FIGURE 144.

Cast from uterine cavity in exfoliative endometritis, membranous dysmenorrhœa, natural size.[2]

[1] Amann. Mikroskopisch-Gynäkologischen Diagnostik.
[2] After Coste. Thomas and Mundé, Diseases of Women.

decidua of early abortion may lead to confusion in diagnosis. The cells of the detached endometrium and their nuclei, however, although sometimes enlarged, as if undergoing a change to decidual cells,[1] are never the product of conception. The membrane discharged from the uterus in the course of extra-uterine pregnancy resembles that of exfoliative endometritis. The discharge of a membrane, therefore, may require careful differential diagnosis between the two conditions. The decidual cells in tubal pregnancy are much larger and do not contain glands; those of the dysmenorrhœal membrane contain uterine glands. The pains of membranous dysmenorrhœa are like severe labor-pains; they usually appear before, and continue with remissions throughout, the flow. Subjective symptoms may disappear in the intermenstrual period, or they may be the ordinary signs of endometritis, the inflammation taking on a somewhat acute character during menstruation. The disease is persistent, intractable, often incurable. The treatment is the same as for obstinate endometritis in general—*i. e.*, thorough sharp curettage, with cauterization of the endometrium, in the hope that the new endometrium may be healthy. Maternity sometimes effects a radical cure. See Chapter LIII.

3. *Senile Endometritis.* After the menopause, when the uterus has undergone senile atrophy, it is subject to a most harassing form of purulent endometritis; it is usually the relic of an earlier infection, and is due to the action of bacteria on the atrophic, less resisting endometrium.[2] The discharge contains numerous bacteria, is commonly offensive, purulent, often tinged with blood, and is so irritating as sometimes to cause a most distressing pruritus vulvæ. The infection may destroy the exhausted senile mucosa and penetrate into the muscularis. Cicatricial stenosis is frequent. Complete cicatricial occlusion in the uterine canal, usually at the internal os, often occurs. This may cause the uterine secretions to be retained and the distended organ to become a thin-walled retention-cyst. The condition is called pyometra or hydrometra, according as the retained fluid is purulent or watery. The uterine canal, if not occluded, is apt to be narrowed at one or more places by cicatricial contraction; this obstruction to the drainage of secretions aggravates the disease. Other forms of endometritis may retard the senile atrophy of the cervix, or the corpus, or the whole uterus, long after the proper time for the complete menopause,[3] and the organ may remain large from this cause. Such enlargement differs from that of distention. In the former the uterine walls are thick, in the latter distended and thin. In most cases of senile endometritis the uterus is not enlarged, but rather in a state of full senile atrophy. The retained products of senile endometritis may give rise to reflex disturbances, innutrition, and to systemic depression, even to septic poisoning.

The microscopic changes are like those of atrophic interstitial endometritis, already described.

[1] C. Runge; compare also Löhlein: Gesellsch. f. Geb. u. Gyn., February, 1886. Zeitschrift f. Geb. u. Gyn., xii. S. 465. A. Martin: Diseases of Women.
[2] Coste: from Thomas and Mundé, p. 631.
[3] Petru: Revue médicale de Suisse Romani, 1893, No. 5. Abstract in Centralblatt für Gynäkologie, 1894, No. 4.

The glands and epithelial elements in the last stages of the disease are destroyed and the submucous structures laid bare. The destruction of the glands makes catarrhal inflammation impossible. The exposure of fibrous tissue, moreover, is favorable to the development of suppuration, granulation, and ulceration—three characteristics of senile endometritis. The disease may be corporeal or cervical, or both. Laceration of the cervix is a frequent complication. The offensive discharge, the occasional uterine enlargement, and systemic depression may lead to confusion between this disease and uterine cancer. Cicatrization may bring about a spontaneous cure. Usually, however, unless cut short by treatment, the suppuration persists.

4. *Tubercular Endometritis.* Incipient tuberculosis of the uterus usually takes the form of endometritis. It may reach the uterus

FIGURE 145.

Menstrual decidua in membranous dysmenorrhœa, as seen by a microscope. *A*, surface columnar epithelium; *B*, decidual cells—*i. e.*, stratum proprium, which shows infiltration of leukocytes; *C*, gland.[1]

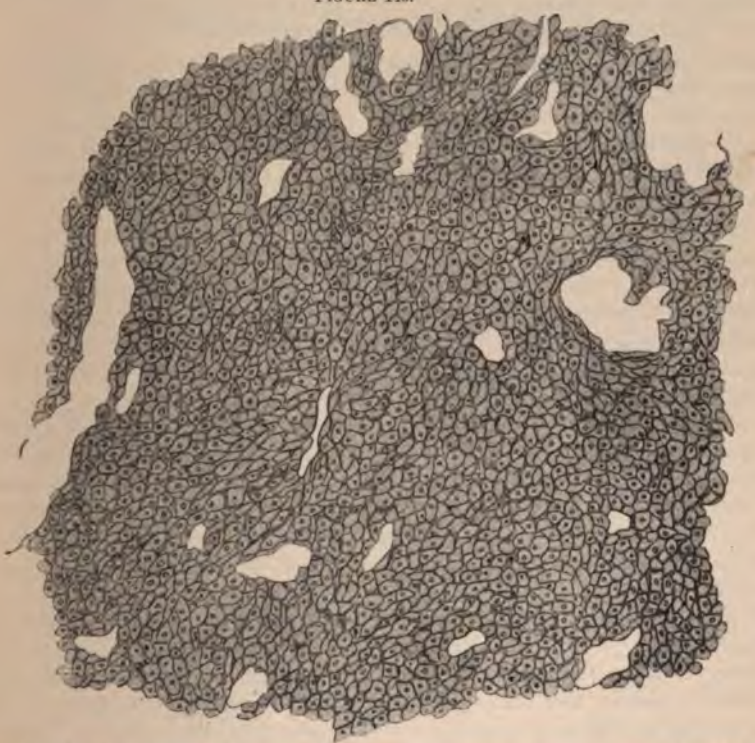
from without by hetero-infection, or may be transmitted by auto-infection from another infected organ. See Tubercular Salpingitis. Hetero-infection is rare, but may occur through the vagina by coitus or by instrumental or digital interference. It sometimes occurs in the cervix in the form of sharply cut ulcers, and when far advanced may extend to the corpus;[2] its clinical resemblance to cancer is then quite marked. Auto-infection generally reaches the uterus through the Fallopian tubes.[3] In such cases the disease finally extends from the endometrium to the myometrium. There is also usually a prior involvement of the peritoneum. Often the pelvic organs—uterus, bladder, colon, rectum, ovaries, and tubes—are matted together by adhesions,

[1] Amann. Mikroskopisch-Gynäkologischen Diagnostik.
[2] Pozzi, vol. ii. p. 204.
[3] Bonnet and Petit, p. 193, Figure 63.

with abscesses and broken-down tissue.[1] Tubercular endometritis is relatively rare; it is recognized by the history of the case and by microscopic examination of the scraping. The disease is incurable by any means except hysterectomy.

5. *Decidual Endometritis* arises during pregnancy. A positive diagnosis cannot be made until pregnancy has been terminated and the decidual changes noted under the microscope. The symptoms suggestive of the condition are hemorrhage, leucorrhœa, and pain, all of which may continue throughout pregnancy. The pain is referable to

FIGURE 146.



Uterine decidua cast off in tubal pregnancy; observe large decidual cells containing no uterine gland; the open spaces are bloodvessels; observe the relatively small nuclein as compared with the cell protoplasm.[2]

the uterus, and may be of the cramping and bearing-down variety. Early abortion with a firmly adherent placenta is the usual result.

6. *Septic Endometritis.* Strictly speaking, all endometritis is septic. The word septic is used in a clinical sense to describe such purulent or mucopurulent endometritis as may be caused by pyogenic micro-organisms after labor, abortions, instrumentation, and digital manipulations. So-called septic endometritis begins as an acute infection, and presents the characteristics already described under

[1] Heeberg. Centralblatt für Gynäkologie, 1892, No. 50.
[2] Amann. Mikroskopisch-Gynäkologischen Diagnostik.

acute metritis. When the disease becomes chronic it usually gives rise to a persistent purulent discharge, which yields only to radical surgical treatment. See Treatment of Endometritis, Chapter XVI.

Symptoms of Chronic Endometritis.

The symptoms of acute endometritis—that is, peritoneal tenderness, hypogastric pain, pelvic weight, rectal and vesical tenesmus—may in some degree continue; but as the disease becomes chronic these symptoms cease to predominate; in their place comes a symptom-group which always contains some of the following factors:

Menstrual and intermenstrual disturbances.
Excessive mucous discharges.
Purulent discharges.
Hemorrhages.
Sterility.
Dragging sensation in pelvis.
Tympany.
Pain in epigastrium.
Vesical and rectal tenesmus, frequent urination.

Systemic disturbances and reflex disorders in other organs, such as flashes of heat and cold, insomnia, troubled dreams, and sometimes a radical change in disposition.

The above symptoms are often observed in other disorders, and are therefore not strongly diagnostic.

Obstructive dysmenorrhœa may result from cicatricial stenosis, especially if the menstrual blood coagulates in the uterus and is forced out by strong contractions. The pain will then be intermittent. Intermenstrual pain from the expulsion of accumulated secretion in the uterus may occur in the same way. The excessive menstrual pain, like labor pain, in exfoliative endometritis has already been noted. Congestive dysmenorrhœa often precedes the flow, but subsides as soon as the engorged vessels are relieved by the establishment of the flow. The uterine nerves, already sensitive from neuritis easily become when crowded by the distended bloodvessels of the swollen uterus, the seat of great menstrual and intermenstrual pain.

Hypersecretion is a constant and pronounced symptom. It may be catarrhal or purulent, or mixed, and often contains blood. Menorrhagia and intermenstrual hemorrhage commonly result from glandular and especially from interstitial endometritis.[1]

Sterility and abortion are frequently associated with the disease. Sterility may result from complicating ovaritis or obstruction in the Fallopian tubes, or from destruction of the spermatozoa by the uterine secretions, or from their mechanical exclusion from the uterus by the plug of tenacious mucus usually found in endocervicitis; or, as soon as the ovule enters the uterus, abortion may occur from the hostile environment of the diseased mucosa. The failure of the ovule to implant itself upon the mucosa may give rise to no subjective symptoms, so that the existence of pregnancy may be unrecognized.

[1] A. Martin. Diseases of Women, pp. 205, 208.

The systemic and reflex disorders are chiefly referable to the nervous system. Among them are neuralgia, indigestion, malnutrition, nervous dyspepsia, anæmia, chlorosis, spinal irritation, and hysteria. The endometritis may be a cause or an effect of the above associated disorders, or together with them may be a concurrent result of some common cause, or may have had primarily no pathological connection with them. The nervous symptoms are usually most pronounced during the few days before menstruation, and may be very marked during the flow.

Diagnosis of Chronic Endometritis.

The diagnosis of chronic endometritis is suggested by the symptoms outlined above. A positive diagnosis must depend upon microscopic examination of the scrapings. The introduction of the sound or probe may slightly wound the inflamed endometrium and cause cramping pains and slight bleeding, and will disclose increased depth of the uterine cavity. Digital examination will in many cases show increased size and hardness of the uterus, and is especially essential as a means for the detection of complications, such as displacement and circumuterine inflammations.

The differential distinction between the numerous varieties already outlined will depend upon the removal of portions of the diseased mucosa and examination by the microscope. A very small curette, without previous dilatation, will often suffice for diagnostic purposes; at least it will settle the question whether a therapeutic curettage is necessary.

A discharge from the vagina or from the Fallopian tubes may be mistaken for the product of endometritis. Inspection will show whether the discharge comes from the uterus or not; a small piece of cotton left for a few hours against the cervix will sometimes show the source. Secretions passing through the uterus from the inflamed Fallopian tube are apt to be rather periodical than constant, and the periodicity is often marked by expulsive pains in the uterus—"colica scortorum"—and followed by temporary relief from pain—*i. e.*, the tube may refill and empty itself at intervals.

Pus from a pelvic abscess is recognized by finding the sinus through which it discharges; such a sinus often opens into the vagina near the uterus, seldom into the uterus.

Differential Diagnosis of Chronic Endometritis.

The diagnosis between endometritis and malignant disease will depend, first, upon the history of the case, the nature of the discharge, and conjoined examination; second, upon the findings of the curette and the microscope. The discharges from carcinoma and sarcoma are more profuse, more offensive, more watery, and usually contain more blood. Cachexia and other systemic disorders are quite marked in sarcoma and carcinoma, but usually absent or slight in endometritis.

FIGURE 147.

Glands of normal uterine mucosa; longitudinal section; two glands shown in cross-section. Glands do not dip into muscularis; semi-diagrammatic.

FIGURE 148.

Same as Figure 147. Modified by hypertrophic glandular endometritis; observe increased size and tortuosity, but no increase in number of glands; interglandular spaces infiltrated with small round cells. Glands dip slightly into muscularis; semi-diagrammatic.

FIGURE 149.

Same as Figure 147. Modified by hyperplastic glandular endometritis. Glands increased in size and number; dip decidedly into muscularis; small round-cell infiltration; great tortuosity; interglandular spaces decreased; condition sometimes called benign adenoma; semi-diagrammatic.

FIGURE 150.

Same as Figure 147. Modified by cylindrical-cell carcinoma; commonly called adenocarcinoma. Observe glandular labyrinth and great rarefaction of stroma. Cannot trace tortuous and atypical glands. Gland elements have broken through tunica propria into interglandular spaces and have invaded also muscularis; semi-diagrammatic.

The differential points between the two forms of chronic glandular endometritis and carcinoma is shown in the four accompanying figures and in the following parallel columns:

Glandular Hypertrophic Endometritis.	Glandular Hyperplastic Endometritis.	Adeno-carcinoma.
1. Glands increased in size but not in number.	1. Glands increased in size and number.	1. Glands very greatly increased in size and number.
2. Interglandular stroma not decreased.	2. Interglandular stroma decreased.	2. Interglandular stroma greatly decreased.
3. No proliferation of gland epithelium.	3. Proliferation of gland epithelium.	3. Very great proliferation of gland epithelium.
4. Gland structures nearly or quite typical in outline. See Figure 148.	4. Gland structures more tortuous in outline. See Figure 149.	4. Gland structures very atypical in outline. See Figure 150.
5. Hypertrophied epithelium confined within the limits of the tunica propria.	5. Proliferation confined within the limits of the tunica propria.	5. The proliferating gland epithelium has broken through the tunica propria and is in direct contact with interglandular connective tissue, and is multiplying in an atypical manner.
6. Gland tissue does not invade muscularis deeply.	6. Gland tissue does not invade muscularis very deeply.	6. Gland tissue may very deeply invade muscularis.
7. Can trace tortuous glands.	7. Can trace tortuous glands.	7. Glandular labyrinth; cannot trace tortuous and atypical glands.
8. Stroma normal in quantity.	8. Stroma decreased in quantity, but clearly defined from glands. Simple filling of gland lumen with epithelium does not necessarily denote malignancy so long as epithelium is confined within basement membrane, *i. e.*, within tunica propria.	8. Great rarefaction of stroma, so that glands touch one another. Glands have broken through basement membrane and invaded interglandular spaces and muscularis. See Chapter XXVIII.
9. Glands evenly distributed.	9. Glands evenly distributed.	9. Gland elements may be very unevenly distributed.

The distinction between endometritis and sarcoma is difficult, and in early sarcoma sometimes impossible. The following points are significant:

Endometritis.	Sarcoma.
1. Progress not rapid after the acute stage.	1. Progress very rapid, especially in the small round-cell variety.
2. Cells do not vary in size or shape.	2. Vary most widely.
3. Walls of blood-vessels clearly separate cells from blood-supply.	3. Intimate relation of blood-spaces to cells. Walls of vessels may be absent, leaving only blood-spaces.
4. Endometritis first involves superficial structure, and later may involve deeper structures.	4. Sarcoma often involves deeper layer first.

Prognosis of Chronic Endometritis.

Relapse is very common. The mildly infectious cases, usually called simple endometritis, yield readily to systemic treatment. The

strongly infectious cases always require surgical treatment. This in most cases will bring about at least a symptomatic cure—*i. e.*, it will stop the discharge and may relieve other symptoms. Whether the diseased uterine mucosa can be restored to its functions will depend upon the extent to which it has been impaired by the disease or must be destroyed by treatment. The prognosis is especially discouraging in exfoliative, senile, and tubercular endometritis. Hysterectomy is sometimes necessary.

CHAPTER XVII.

CHRONIC ENDOMETRITIS (CONTINUED).

Treatment.

THE treatment varies with the structures involved, the nature of the infection, the chronicity of the disease, and with the preponderance of systemic or local origin. The treatment of cervical differs from that of corporeal endometritis; that of a gonococcus infection might have to be energetic and strong, while a milder infection would require only simple or expectant treatment. Obstinate cases of long standing may yield only to the most radical surgical measures. Many authors attempt to draw a line between what they call simple endometritis and septic endometritis. This line can have neither a scientific nor a clinical basis. It is better to distinguish, on the one hand, the catarrhal non-purulent cases in which general circulatory disturbances—that is, diathetic, systemic causes—predominate; and, on the other hand, the cases in which local infection predominates: in the first class of cases predisposing causes predominate; in the second class, exciting causes. See Chapter X. The septic element is not confined to the second class, nor the systemic element to the first. An appreciation of the foregoing will suggest the following division of treatment:

1. Systemic treatment.
2. Topical treatment.
3. Surgical treatment.

1. SYSTEMIC TREATMENT OF CHRONIC ENDOMETRITIS.

Systemic Treatment is applicable to a very large class of cases, sometimes called subinflammatory, which arise not so much from local infection as from stagnation of the general circulation. The stagnation is associated usually with disorders of the heart, lungs, liver, kidneys, or with such disorders as anæmia, leukæmia, chlorosis, diabetes, rheumatism, and gout. The uterus may participate in the general circulatory disturbance and take on a catarrhal condition. In this class of cases the catarrh usually involves not only the uterus, but also extra-pelvic organs, especially the organs of the respiratory, digestive, and urinary systems. The mucous membranes generally are less resistant and therefore more liable to infection. Catarrh is often the vicarious act of a mucous membrane to throw off

waste-products which it would not normally have to eliminate at all. When relieved of such unnatural function the resistance to the microbe is increased thereby, and in this way the infection may cease.

It is clear from the foregoing that in the absence of marked local infection the treatment should be not so much local as systemic. Indeed, when the uterine disorder is mainly consequent upon systemic causes local treatment may be useless, perhaps injurious. On the other hand, the uterus participates in the general improvement when the extra-pelvic and systemic disorders mentioned in the preceding paragraph have been relieved. The needs are, first, a thorough diagnosis from the standpoint of internal medicine, and, second, the treatment of any condition which may disturb the balance of the general circulation or nutrition. If the uterine secretions are purulent, or systemic treatment proves inadequate, topical or surgical treatment may be imperative.

Rheumatic, gouty, and syphilitic subjects require special hygienic and medical treatment. Rheumatism and gout very often cause and perpetuate endometritis. It is imperative that the kidneys be made to eliminate their proper amount of urea and other solids, otherwise the burden may fall on the mucous glands of other organs, for example, the uterus. In every case, therefore, a quantitative urinalysis should be made to estimate the total solids excreted in twenty-four hours. In the uric acid diathesis, lithia spring waters, or the salts of lithia in solution, are most useful. The granular effervescing sodium phosphate in copious draughts of pure soft water is quite as good as mineral spring water, possibly better. The diet should include less animal and more vegetable food. Anæmia, notably the anæmia of fat women, is often the cause of local engorgement, especially in the uterus. In such cases local treatment is useless. Iron, manganese, the bitter tonics, mineral waters, nutritious food, adequate exercise, and regular habits are essential. The thyroid extract has been much praised in the treatment of this class of anæmic women, and the use of it is said to be followed by rapid reduction of fat. Endometritis associated with syphilis will often yield to specific treatment.

Constipation is almost constantly associated with uterine catarrh. Large accumulations of old, hard fecal matter displace and keep up constant engorgement of the uterus and other pelvic organs. The successful treatment of constipation is essential to the relief of the endometritis. The treatment should be rather regulative than medicinal. Strong laxatives tend to congest the abdominal and pelvic organs—the very condition we want to relieve—and should therefore be avoided. Hygienic measures alone may be adequate. These include regular properly selected diet, regularity in exercise and especially in times of going to stool. Massage is a most valuable remedy, both for its direct influence on the action of the bowels and on the general circulation. Mineral waters, magnesium sulphate, magnesium citrate, lithium citrate, sodium phosphate. Carlsbad salts are most useful. They are best given in copious draughts upon

rising in the morning. A large draught of cold water at the same hour will often cause free action of the bowels. The conventional pill or some positive cathartic like aloin or podophyllin at bedtime, which usually acts strongly the next morning, is objectionable, and such drugs if given at all should be in small divided doses combined with iron and nux vomica, and given at least three times a day. The cathartic dose should be diminished each time the prescription is renewed until only the tonic remains. Polypharmacy is to be avoided.

Tablet triturate of calomel long continued in very small doses—one-thirtieth to one-tenth of a grain—three times a day fulfils a multiple indication. It establishes a steady stream of bile—bile is a most effective intestinal antiseptic—through the intestines, renders the glandular organs more active, dislodges morbid accumulations, and secures proper elimination through the bowels and kidneys. All this balances the circulation and stimulates nutrition. No single drug has greater value than calomel in the treatment of the inflammatory affections of the mucous membrane when due to stagnation of the general circulation. The bichloride of mercury in minute doses—one-hundredth of a grain—may be equally useful. In the continued use of mercurial salts always observe the usual rule to secure normal freedom of the bowels, if necessary, by the judicious use of salines.

Colonic flushings of warm castile soapsuds, or of a 1 per cent. solution of sodium bicarbonate—from one to three quarts—are most useful, especially in the early treatment of obstinate constipation. They should be given in the left latero-prone position—Sims' position—or, better, in the knee-chest position. To be most effective they must be very copious, slowly given, and retained at least for several minutes. Five per cent. of glycerin adds to their effectiveness. The prompt disappearance of bearing-down, dragging-pains, backache, bowel distention, intestinal indigestion, and depression, which often follows the clearing out of the bowels, is in striking contrast with the frequent disappointment, not to say increase of symptoms, which usually follows the time-honored topical treatment. The disease is most obstinate in virgins. In corpulent young women cure is almost impossible unless the nutrition be improved and the weight reduced.

The general and sexual hygiene, too often neglected, including dress, exercise, food, sexual relations, and care at menstruation, has already been discussed. Special attention should be given to local and general bathing. A comprehensive grasp of the subject, however, involves the whole field of general internal medicine.

2. Topical Treatment of Chronic Endometritis.

Topical Treatment has been as much over-estimated as systemic treatment has been neglected. Multitudes of women have, unfortunately, formed the habit of receiving useless routine treatment for the relief of uterine discharges. Once eliminate the cases described in the foregoing paragraph which require not local, but

systemic treatment, and the remainder will be entirely curable, and will be made up mostly of the milder infectious cases. Few scientific gynæcologists to-day place great value on intra-uterine treatment for distinctly infectious endometritis. The number of such cases definitely cured by topical applications, when compared with the great number treated, is insignificant. In making such comparisons we must exclude numerous cases which have needed only systemic treatment, and have been cured by it notwithstanding the associated topical treatment which may do no good.

The endometrium has been the subject of a vast amount of sometimes mild, most often severe, futile destructive topical treatment. Since other organs, the rectum, sigmoid, bladder, and eye, are subject to the same catarrhal conditions and subject to them from the same general causes, consistency would indicate topical treatment for them also. If in a given case, for example, the whole intestinal canal and bladder and endometrium were catarrhal, it might be quite as reasonable to apply fuming nitric acid to all as to one. Such an experiment would not only show that the human uterus has endured an immense amount of abuse, but would successfully demonstrate the absurdity of topical treatment applied to a mucous membrane when the discharge is only one of many local evidences of a general condition. Clearly a large proportion of cases belong rather to internal medicine than to gynecology. Very significant is the fact that long-continued and often repeated handling of the genitals may give rise to psychic irritation or depression. A woman once habituated to local treatment may even become a monomaniac on that subject.

The milder intra-uterine treatment as ordinarily practised is long, tedious, and, if not useless, at least uncertain. Such treatment, whether mild or severe, at the doctor's office or at the patient's house, if frequently repeated with indifferent aseptic care, often sets up new infection, or may carry the old infection to deeper structures. This may dangerously involve the parametric lymphatics and veins, the myometrium, Fallopian tubes, cellular tissue, peritoneum, and ovaries. As a rule, the cases which do well on mild, topical treatment would often do better on systemic treatment alone. If exceptional cases of non-purulent uterine catarrh require local applications, such treatment should never be long continued.

Intra-uterine treatment is often effective only in proportion to the energy of it. Those applications which have the power to destroy the diseased structures will sometimes arrest purulent endometritis. In doing this, however, they may destroy the endometrium, injure the myometrium, and reduce the uterus to a cirrhotic-like, cicatricial condition. Sterility and permanent irritability of all the pelvic organs are a natural result. Electrolysis, nitric acid, chromic acid, chloride of zinc, acid nitrate of mercury, and the actual cautery, especially if often applied, produce cicatricial stenosis and atresia, with all their evil results. Already numerous operations have been devised with but little success to reopen the contracted uterine canal.[1] The chlo-

[1] Of these that of Otto Kustner, of Breslau, is the latest and most radical. Centralblatt für Gynäkologie, No. 30, 1890.

ride of zinc pencil produces a slough of the endometrium and sometimes of muscular tissue; the use of it may be followed not only by a chronic purulent discharge, but also by a serious infection of the appendages from the septic sloughing endometrium. The endometrium now has lost permanently its epithelial covering, the chief protection of the uterus against bacterial invasion. Contrast this condition with that in which the diseased structures have been removed by an aseptic curettage and the healthy abraded surfaces are all ready to reproduce a new endometrium. The frequent application of strong caustics to the endometrium is prohibited.

Electricity is painful, tedious, dangerous, and often unduly destructive. Great cicatricial formations and hopeless stenosis in the endometrium are among the possible results. These effects are not limited to the diseased, but may include healthy structures. The immediate dangers are greater than those of aseptic curettage. Generally speaking, the method is not to be approved.

It is not the author's purpose to condemn unreservedly the conventional treatment. He has tested carefully the vaginal douche, the swabbing out of the uterus with cotton, the injection of astringents, the vaginal and intra-uterine application of dry powders, intra-uterine pencils of various alterative and caustic substances, wool glycerin tamponade, electricity, and intra-uterine gauze tamponade. The patient use of such means has been followed by much disappointment, to say nothing of positive harm. Topical treatment should seldom be long continued. It has a more legitimate place as a supplement than as a substitute for systemic and operative treatment. A reproach will be lifted from the medical profession when the indiscriminate use of topical treatment has been relegated to the dark ages of gynecology.

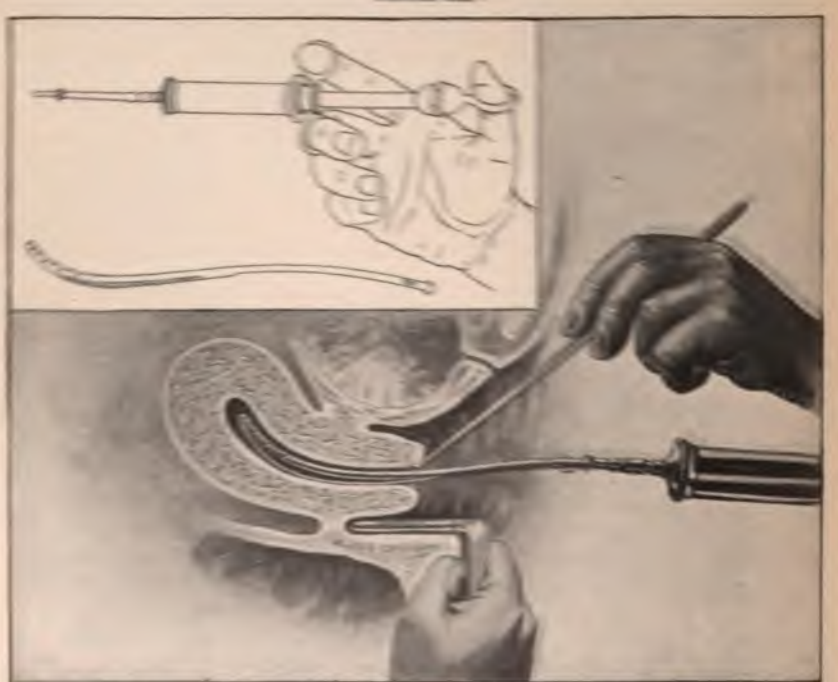
If topical treatment is to be used, especially if it is to be intra-uterine, let the aseptic precautions be as careful as for a surgical operation. See Chapters II. and IV. The patient should invariably have had a thorough vaginal douche of aseptic soapsuds, with careful cleansing of the external genitals and vagina. The cervix is exposed with Sims' speculum; then the vagina is wiped thoroughly with dry absorbent cotton on dressing-forceps and swabbed with cotton saturated with a 5 per cent. solution of carbolic acid or a 1 per cent. solution of creolin. Slight traction is now made on the cervix by tenacula or blunt-tooth forceps, to straighten the uterine canal, and the endometrium is cleansed by means of cotton wound on an applicator. The cervical plug of mucus, if present, should be removed. The desired application may then be carried into the endometrium by means of the applicator wound with fresh absorbent cotton, or, if the canal be very open, by means of fine dressing-forceps. A pledget of cotton saturated with glycerin or a 10 per cent. mixture of ammoniated ichthyol and glycerin may be placed in the vagina as a protection and for its hygroscopic effect. Over this place a pledget of dry cotton, to keep the first in position and to absorb moisture. The vaginal tampon should be removed in twenty-four hours. Intra-uterine cleanliness is the first requisite. To secure this, an open canal and

normal drainage are essential. During such treatment coitus is prohibited.

Intra-uterine gauze tamponade has been extensively used for dilatation and drainage in the non-gravid cases. Increasing quantities of a narrow strip of antiseptic gauze are packed into the uterus in successive treatments, until the endometrium has become gradually dilated to a diameter of one-third or one-half inch. This dilatation permits easy and thorough intra-uterine topical treatment and drainage, especially capillary drainage when the gauze is in place. This method, in the author's hands, has been occasionally successful, but less so than the reports of its advocates would seem to promise. Great care is necessary lest the gauze, instead of carrying out septic material, may carry it in.

It would be confusing and is unnecessary to name the innumerable drugs and chemicals which are hailed for intra-uterine medication. Carbolic acid and iodine, for their disinfectant and astringent effect, meet the requirements in glandular endometritis so far as topical

FIGURE 113.



Patient in dorsal position. Cervix exposed by perineal retractor in right hand of nurse. Uterus drawn down with tenaculum in left hand of operator. Alcohol or other desired fluid injected into endometrium by means of special canula attached to syringe. This syringe, worked by right hand of operator, is shown in the upper left-hand corner. Canula is here shown as detached from the syringe. Outflow of injected fluid is secured by a wire attachment running parallel to the canula and a little below it.

treatment can meet them. Ichthyol in interstitial endometritis, although useful, has not fulfilled its early promise.

Under the conditions and restrictions already set forth, the author, in cases of obstinate, profuse endometritis, sometimes makes an application of 40 per cent. formalin to the endometrium, and in some very intractable cases may repeat this once or twice at intervals of a month. This application is best made by means of a uterine applicator wound with cotton, the vagina being protected by a wad of cotton placed behind the cervix uteri.

More conservative and perhaps more effective than formalin is the intra-uterine injection of *absolute* alcohol. Preparatory to the injection of the alcohol the endometrium should thoroughly be cleansed either by wiping out with cotton or by irrigation with water. One or two drachms of alcohol should be injected at each treatment. In order to prevent the alcohol from being forced through the Fallopian tubes, it should be thrown in gently and allowed to run out; the injection is to be repeated twice a week: if in two months there is not marked improvement, the treatment should be interrupted and after curettage resumed. The technique of injecting the uterus with alcohol is shown in Figure 151. In place of the instruments here presented, may be used an ordinary small glass female catheter attached to a common ear syringe by means of a short rubber tube.

3. Surgical Treatment of Chronic Endometritis.

Technique of Curettage. The accompanying series of five illustrations, Figures 152 to 156, shows the steps of the operation of sharp curettage. The dilatation should be begun with a small light dilator, Figure 152, and continued with a larger dilator of the Wathen type, Figure 153. This instrument is of heavier construction and the blades of it have great expanding power. After the uterus has been dilated to the extent of one-half to three-quarters of an inch the endometrium is subjected to sharp curettage, as shown in Figure 154. In curettage of the uterus the perineal retractor may to advantage give place to the index and middle fingers of the left hand, while the operation is performed by means of the curette in the right hand. After thorough curettage the uterus is flushed out with sterile water, Figure 155. As shown in Figure 155, the canula used for this purpose may be a simple glass female catheter attached to a rubber tube. This tube leads from a funnel held by a nurse above the patient. The water flows from the funnel through the tube and the glass canula into the uterus until the endometrium is thoroughly irrigated. During the irrigation the canula should continually be withdrawn and reintroduced, in order to prevent the possible forcing of the injected fluid into the Fallopian tubes. Observe the forceps fastened to the rubber tube. This is a practical device for reducing the size of the rubber tube so that it will fit a canula or catheter of smaller size. Not infrequently this difference in calibre between the tube and canula gives rise to considerable annoyance during an operation, which may be obviated much more readily and quickly by means of the forceps thus used than by the common means of tying a strong cord tightly around the end of the tube at the point where it receives the canula.

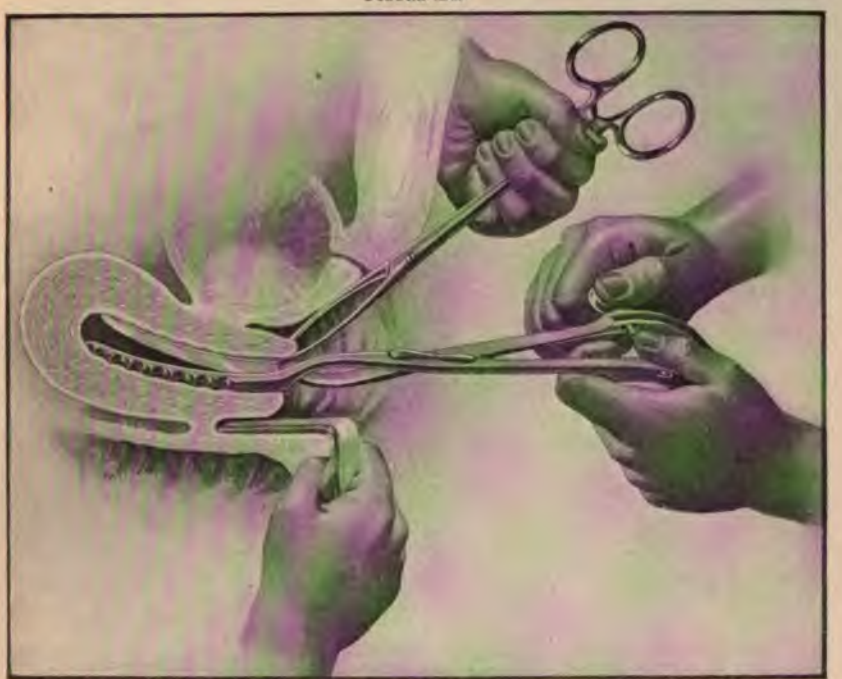
... fountain-syringe may be ... syringe is hung usually ... serve the patient. Some- ... ation is delayed because ... the douche bag. To over- ... by two pairs of pressure ..., the upper forceps being ... forceps to the douche bag. ... entire, B shows the forceps

... Cervix exposed by perineal retractor in right hand ... forceps in left hand of assistant. Dilatation begun ...

... douche bag more in detail. The operation is ... front of a window. Therefore the curtain may ... fasten a towel with safety-pins. The upper ... to the towel. The reason for utilizing a towel ... is because the towel is clean, while the curtain

... having been completed, the fingers of the operator ... the vagina, the perineum again retracted by means ... speculum in the hand of the nurse or assistant, and the ... out by means of cotton wound on a dressing-forceps,

FIGURE 153.



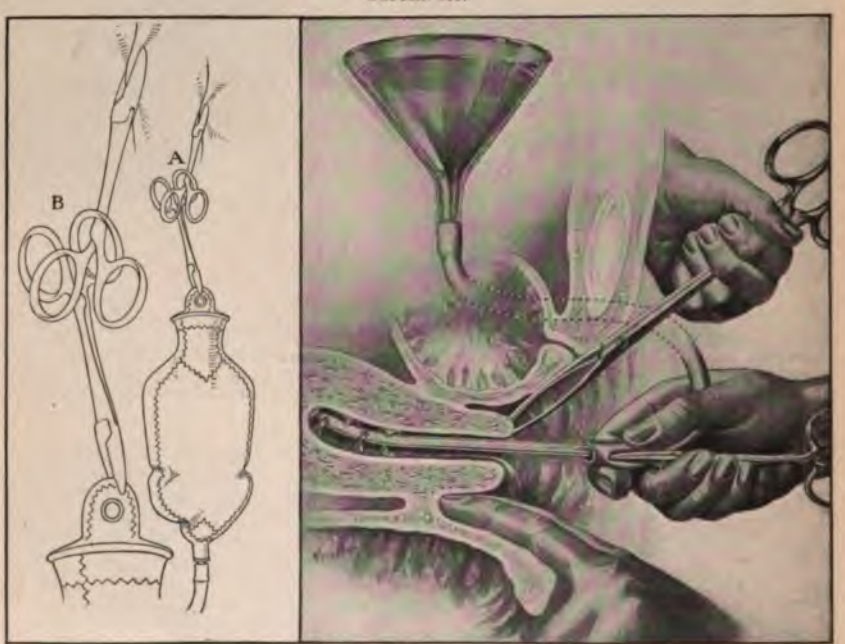
Curettage. Second step: dorsal position. Cervix exposed by perineal retractor in right hand of nurse. Uterus drawn down by vulsellum forceps in left hand of assistant. Dilatation completed by Wathen dilator in hands of operator.

FIGURE 154.

Curettage. Third step: dorsal position. Perineum retracted by two fingers of operator's left hand. Uterus drawn down by vulsellum forceps in left hand of assistant. Endometrium curetted by sharp curette in operator's right hand.

Figure 156. The cotton may be saturated with any desired disinfectant. A saturated solution of iodine crystals in 95 per cent. of carbolic acid is perhaps most frequently used. If very thorough disinfection is required, 40 per cent. formalin may be employed. Because of its destructive power formalin should be used with care, lest it cause cicatricial contraction. In order to prevent the application from coming in contact with the vagina, it is well, as shown in the figure, to protect the vaginal mucosa with a pledget of cotton placed between the posterior wall of the cervix and the perineal retractor. Before making the application two forceps or applicators should be wound

FIGURE 155.



Curettage. Fourth step: dorsal position. Perineum retracted by two fingers of operator's left hand. Uterus drawn down by vulsellum forceps in left hand of assistant. Endometrium irrigated by canula inserted into rubber tube in operator's right hand. Figures *A* and *B* show a fountain syringe attached to a towel by means of pressure-forceps. The towel may be fastened to a curtain or other hanging by means of safety-pins. The fountain syringe may be used instead of the funnel.

with absorbent cotton, and one should be pushed into the uterine canal with the cotton dry in order to absorb any fluid which may remain after the irrigation. The cotton on the other forceps should now be dipped in the desired disinfectant and introduced just as the first is withdrawn. The wad of cotton posterior to the cervix, the application forceps, and all other instruments are now removed. No dressing is required. A vaginal douche containing one-half of one per cent. lysol should be given twice daily for a period of two weeks. This is the only special after-treatment.

When the endometritis is distinctly infectious and chronic, both topi-

cal and systemic treatment are usually inadequate, although either may properly supplement surgical measures. The disease of the mucosa should then be removed by the *sharp curette*. The operation is rendered extra-hazardous by active inflammation in the Fallopian tubes or by any other active pelvic inflammation which

FIGURE 156.

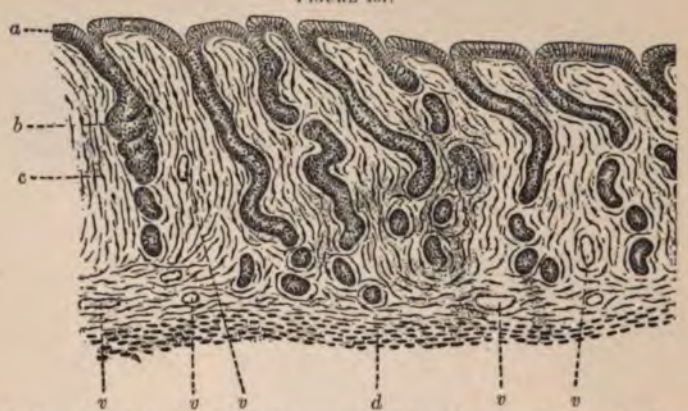
Curettage. Final step: dorsal position. Perineum retracted by Simon retractor in right hand of nurse. Uterus drawn down by vulsellum forceps in left hand of assistant. Endometrium disinfected by cotton wound on Emmet's dressing-forceps and saturated with desired disinfectant. Application made by right hand of operator.

renders the uterus immobile or very sensitive to the touch. If for any reason it must be done under these adverse conditions, the greatest aseptic care should be taken to prevent dangerous lymphangitis, phlebitis, and peritonitis. A general description of curettage will be found in Chapter V. Salpingitis, ovaritis, peritonitis, and cellulitis were formerly considered positive contraindications for invading the uterine cavity. At present, although, these diseases, if chronic, call for especial care, they are not to be considered as necessarily prohibiting intra-uterine operations, provided these operations are of such a character as to remove the disease from the endometrium. They do, however, prohibit all intra-uterine interference which falls short of this. Ordinary intra-uterine treatment, even examinations with the sound, may be more dangerous than thorough

dilatation and sharp curettage. Incomplete dull curettage is specially dangerous, for it exposes the surfaces to absorption and at the same time may leave infectious matter to be absorbed. Inflamed tubes and ovaries often become healthy, or at least symptomatically cured, after the primary source of infection has been removed from the uterus. In order to facilitate the curettage and insure drainage let the dilatation be thorough.

Regeneration of Endometrium after Curettage. Not only is the sharp curette efficient, but the recent investigations of Werth[1] and others show that prompt regeneration of the uterine mucosa follows its use. Studies of the recently curetted endometrium show that the work is often imperfectly done, and that large portions of the diseased mucosa, particularly in the cornua and lateral walls, are apparently inaccessible to the ordinary curette. Special small curettes should therefore be used for these parts.

FIGURE 157.



Vertical section of uterine glands three months after sharp curettage. *a.* Surface epithelium. *b.* New-formed glands. *c.* Interglandular tissue. *v, v.* Bloodvessels. *d.* Muscular tissue.[2]

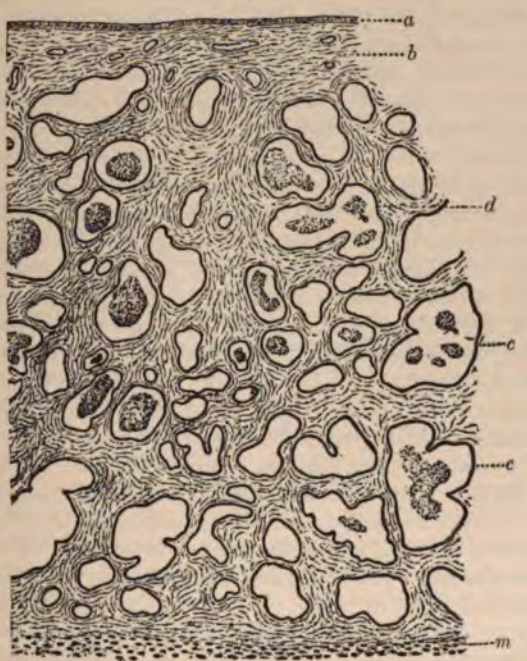
Werth reports histological examinations of six uteri removed at periods varying from three to sixteen days after curettage. All cases showed unequal results of the scraping on the various parts of the uterine mucosa. Some parts were untouched. In some the superficial layers had been removed and the deeper layers left, and in other parts the muscularis had been attacked. The mucosa in the fundus and in the lateral portions of the cavity was most frequently left intact. The abrasions on the anterior wall were deeper than on the posterior. They were also deeper in the lower part of the corpus near the internal os. This is explained by the convergence of the downward strokes of the curette. Except in places where the muscularis had been injured by the curette, the entire lining of the uterus was covered with new mucosa, the glands opening freely on a surface of unbroken superficial epithelium. This young mucosa was characterized by a great preponderance of fibrillary connective tissue over the connective tissue of the stroma. The regenerating tissue was

[1] Centralblatt für Gynäkologie, No. 7, 1895.
[2] Nouv. Arch. d'Obstétrique et de Gynécologie.

supplied with bloodvessels which grew out of the muscularis or out of the remaining mucosa. The vessels were surrounded with a broad mantle of fibrillary connective tissue which followed their ramifications almost to the surface of the mucosa.

The glands were regenerated from their deeper portions that the curette had spared, especially from those which were situated where the mucosa dips deep down into the muscularis; they grew out toward the surface together with the surrounding bloodvessels and fibrillar connective tissue. The surrounding stroma was observed

FIGURE 158.



Uterine mucosa fifty-three days after cauterization. *a*. Surface epithelium. *b*. Connective tissue. *c* and *d*. Cross-section of glands deprived of their epithelium and in a state of cystic degeneration, some of them much dilated. *m*. Muscularis.[1]

frequently to grow more rapidly than the glands, and to give a somewhat irregular, jagged contour to the regenerated endometrium. The superficial epithelium was found to be regenerated principally from that of the glands. In some places the young epithelial cells were found flattened and enlarged. In the later stages of the regeneration of the mucosa the excess of fibrillary connective tissue was observed to disappear by hyaline degeneration. This process on the fifth day after curettage was visible in the subepithelial layers; and on the tenth day only a few fibrillæ were left in the superficial stroma; in their places were large, spindle-shaped cells, with several processes of protoplaspm. Only in those parts where the muscularis

[1] Nouv. Archiv. d'Obstétrique et de Gynécologie.

had been abraded existed a condition which resembled that of granulation tissue.

Figure 158 will convince the student that destructive cauterization, at least during the age of maturity, is most objectionable.

A thorough application to the endometrium of a saturated solution of iodine crystals in 95 per cent. carbolic acid, immediately after the curettage, is desirable. Its action on any neglected portion of the diseased endometrium may be good; it insures asepsis, and by its coagulating effect plugs the open lymphatics and veins, which otherwise might become the carriers of possible infection to the deeper structures. The application, if indicated by the uterine discharges, may be repeated just before the next menstruation. When the application is made immediately after the curettage all blood should have been previously washed out of the uterus, and its flow, if profuse, stopped by means of a saturated aqueous solution of antipyrine. Many operators [1] omit the iodine application, and maintain that the results are better when it is not used. The author's experience has been in favor of its use. Uterine gauze tamponade immediately after curettage is strongly indorsed by most operators. Entirely good results may, however, be obtained without it. The objections to its use are that, even though lightly packed, it is often promptly expelled by powerful uterine contractions, and that instead of draining it may reinfect the uterus. The more thorough the dilatation is before curettage the less liability there will be to expulsion of the gauze by uterine contractions.[2]

The treatment of endometritis, even with the curette, is not uniformly successful. Dilated and obstructed bloodvessels cannot always be restored to their proper calibre. Disorganized lymphatics, nerves, and glands do not always resume their normal functions. Regeneration of lost structures is not always possible. In these respects endometritis offers a close analogy to nasal catarrh. In the glandular forms of the disease, in which the endometrium yet retains sufficient integrity to insure regeneration of the glandular and epithelial structures, the sharp curette offers both a symptomatic and a histological cure. When the disease has progressed to the atrophic stage of interstitial endometritis and the endometrium is physiologically destroyed, anatomical cure is impossible and only a degree of symptomatic cure is possible. When endometritis is complicated with extensive chronic metritis and obstinate pelvic infection, the uterine discharge will persist regardless of curettage or of any other intra-uterine treatment. Under such conditions hysterectomy may be the only means of relief. Since this extreme measure might be indicated more for extra-uterine than for uterine inflammation, the consideration of it is referred to the subject of Inflammation of the Uterine Appendages.

[1] Krug: American Gynecological and Obstetrical Journal, January, 1896, p. 79. Pryor: Ibid., p. 10.

[2] Loc. cit.

CHAPTER XVIII.

CHRONIC METRITIS.

CHRONIC metritis is usually understood to mean inflammation of the uterine muscularis, a condition more accurately described by the word myometritis. The former term is here taken in its broader literal sense, and is used to designate chronic inflammation of the uterus as a whole, and to include chronic metritis, chronic endocervicitis, chronic endometritis, myometritis, and perimetritis. Uterine inflammation, acute or chronic, generally starts in the mucosa. The various parts of the uterus—*i. e.*, the endometrium, myometrium, perimetrium, corpus, and cervix—are never involved in sharply cut areas of disease, although any one of them may be the specially affected part of the diseased organ. In this respect chronic and acute infection are alike. The endometrium, however, often furnishes the groundwork for the pathology, diagnosis, prognosis, and treatment. In some cases the infection is nearly or wholly confined to the endometrium. The disease is commonly the consequence of endometritis and coincident with it.

Infection of the uterus as observed by the clinicians, except acute gonorrhœal and puerperal metritis, is generally chronic.

The striking phenomena of acute metritis are the active infective and inflammatory processes. The term chronic metritis stands not so much for definite processes as for certain chronic changes, more or less permanent, in the quantity and quality of the glandular elements, muscularis, bloodvessels, lymphatics, and connective tissue. These changes are usually hypertrophic, hyperplastic, or atrophic.

Chronic heart, lung, liver, and other visceral diseases which embarrass the circulation appear to cause conditions which are histologically similar if not identical with those of chronic metritis. These conditions have been the subject of a long and unsatisfactory discussion, and have variously been designated as infective, inflammatory, irritative, subinflammatory, and congestive. Although the changes may not always conform to the strict idea of inflammation, there is yet a clear propriety in calling them inflammatory, because the essential element of inflammation—round-cell infiltration—is usually present. As in other chronic inflammations, migration of these cells occurs, if at all, more slowly than in acute inflammation.

Etiology of Chronic Metritis.

The chief predisposing causes are these:

1. Acute metritis, endocervicitis, and endometritis.
2. Septic puerperium.

3. Abortions.
4. Infection following operations and examinations.
5. Uterine tumors.
6. Frequent parturition.
7. Uterine displacements.
8. Obstructed circulation in the abdominal viscera, especially the liver.
9. Excessive venery.
10. Arterio-sclerosis of the uterus.
11. Rheumatism, gout, lithæmia, and cholæmia.

The bacterial exciting causes are the same as in Acute Metritis, see Chapter X.

Pathology of Chronic Metritis.

Since chronic metritis is the sum of all the inflammations of the uterine mucosa, uterine muscularis, and uterine peritoneum, it follows that the pathology of it must be embraced in:

I. Chronic changes in the mucosa—endometritis and endocervicitis—of which the pathology has been described in Chapters XV. and XVI.

II. Chronic changes in the perimetrium—peritonitis—which will be outlined in the chapter on Pelvic Peritonitis.

III. Chronic changes in the muscularis of an inflamed uterus, which occur in two forms:

1. Hypertrophic metritis.
2. Interstitial metritis.

1. Pathology of Hypertrophic Metritis.

In this form of chronic metritis there is increase of all the histological elements. Hypertrophy of puerperal origin should be distinguished from that of non-puerperal origin.

Puerperal hypertrophy, commonly known as *subinvolution*, is produced as follows: The muscular elements, enormously increased during the evolution of pregnancy, fail to undergo the normal physiological degeneration and absorption after labor. The connective tissue also remains superabundant. The lymph-vessels and bloodvessels continue large, full, and stagnant. The uterine walls are thickened from congestion and infiltration. The entire uterus is usually, although not always, uniformly enlarged—that is, the hypertrophy may pertain especially to the cervix or to the corpus uteri. The uterus may be twice as large as normal, and the canal may measure three or four inches. The organ remains soft and mobile. This flexibility accounts for the fact that many uterine flexures date from the puerperium. *Subinvolution may therefore be defined as the failure of a physiological hypertrophy to subside after labor.*

Non-puerperal hypertrophy is pathological from the beginning, and often occurs in women who have never been pregnant. It is sometimes clinically impossible to distinguish between the puerperal

and non-puerperal varieties. Both are apt to be the result of myometritis.

Great hypertrophic elongation of the supravaginal and enlargement of the infravaginal portions of the cervix, with descent, are described in the chapters on Laceration of the Cervix and Displacements. Sometimes hypertrophic enlargement pertains chiefly to the corpus uteri, sometimes to the cervix; or it may uniformly involve the entire organ. Hypertrophy of the cervix often is confounded with laceration. The symptoms, like the causes, are almost identical with those of the associated endometritis. In the absence of marked endometritis, perimetritis, or parametritis, the uterus is not very sensitive to the touch. Downward displacement from increased

FIGURE 159.

Hypertrophy of the cervix uteri; the spreading apart of the cervix is due partly to laceration and eversion.

FIGURE 160.

Hypertrophy of the corpus uteri.

weight is usual. Perverted menstrual and other functions are the same as in endometritis.

The prognosis is much more favorable for puerperal than for non-puerperal myometritis. Subinvolution, if non-infectious, is often only temporary. The disease is apt to be obstinate and destructive in proportion as the infectious element predominates.

2. Pathology of Interstitial or Cirrhotic Metritis.

In this form of metritis, sometimes called *areolar hyperplasia*, there is increase of the connective and loss of the muscular tissue. The musculature is pale and indurated. The microscope will show hyperplasia of intermuscular connective tissue, corresponding atrophy of muscle-fibres, and contraction of bloodvessels. The chronic changes in these various parts may be the outcome of acute processes already described under acute metritis; or there may have been no clearly marked acute stage—*i. e.*, the disease, at least apparently, may have been chronic or subacute from the beginning.

Hyperplasia of the connective tissue, whether puerperal or non-

puerperal, may follow hypertrophy or may develop independently of it. This form of the disease often results in a sort of pathological involution, with the following permanent changes: The lymph-vessels and bloodvessels shrink and wither, the nutrition of the muscular elements is cut off, and they disappear as if crowded out by the increasing connective tissue; the uterus now becomes hard and anæmic; it still may remain large from the superabundant connective tissue, but finally this may contract and, cicatrix like, reduce the organ even below its normal size. The result of these changes is great uterine irritation and pelvic pain. The whole organ with its appendages and adjacent structures is in a state of permanent malnutrition.

In connection with the atrophic changes of interstitial and cirrhotic metritis may be mentioned two special forms of atrophy: puerperal atrophy—superinvolution—and a certain form of non-puerperal atrophy.

Puerperal Atrophy—superinvolution—is the direct opposite of subinvolution. In superinvolution the process of degeneration and absorption after labor passes beyond the physiological limits, and the uterus shrinks below the normal size and becomes soft and excessively mobile. The condition resembles senile atrophy of the menopause. Apparently there are two distinct varieties of superinvolution—one temporary, the other permanent. They are differentiated by the fact of a normal puerperium in the temporary form, and by the history of a febrile puerperium in the permanent variety. In the latter case one or more of the reproductive organs or parts thereof—*i. e.*, the endometrium, myometrium, and the uterine appendages—become infected and physiologically destroyed. In the temporary variety spontaneous recovery may occur and the woman may again bear children. In the destructive form there is permanent atrophy of all the structures involved. Menstruation, if it returns at all, is scanty and generally painful. Immediate amenorrhœa is the rule. There is sometimes a painful molimen in place of menstruation.

Non-puerperal Atrophy. There is another class of cases in which atrophy of the reproductive organs occurs independently of parturition. This form of atrophy is generally the result of chronic wasting disease, like tuberculosis and diabetes; or of acute infectious disease, like scarlatina, rubeola, and enteric fever. There is always cessation of menstruation. This is a conservative effort of nature to save the patient's blood and strength. Unfortunately, however, the ill-health of the patient often is attributed wrongly to the amenorrhœa, and treatment designed to stimulate and re-establish menstruation sometimes is used. By such means the woman's vitality may still further be exhausted. The above facts from the therapeutic standpoint, especially in tubercular and other wasting diseases, are very significant. Clearly the treatment should not be local, but systemic.

Superinvolution and non-puerperal atrophy are rare; the causes are obscure; the precise relation of inflammation to them is unknown. Except in the temporary non-infectious form already mentioned, recovery rarely or never takes place.

Arteriosclerosis. Chronic metritis in advanced years is not

uncommonly associated with sclerosis of the uterine arteries, and in some instances with calcareous degeneration of the vessels; these changes if looked upon as senile degeneration may not be always, in the strict sense, pathological, but may be rather the natural changes of old age.

The Physical Signs of Chronic Metritis.

1. The uterus is enlarged symmetrically, and on bimanual examination is harder and firmer to pressure than normal. Atrophic changes later may cause the uterus to contract to rudimentary size.
2. Tenderness on pressure is not very marked unless there is complicating inflammations of the uterine appendages.
3. The uterus may be freely movable or fixed by adhesions.
4. The uterus may be displaced; and, if so, the deviation is apt to be anteversion and descent; this gives rise to vesical and rectal irritation.
5. Enlargement of the uterine cavity is demonstrated by conjoined examination and by passing the sound.

The Symptoms and Diagnosis of Chronic Metritis.

1. The temperature is normal or only slightly elevated.
2. Pain is not acute; there is usually a sense of aching, pressure, weight and dragging in the back, hypogastrium, and thighs.
3. Menstrual disturbances, such as menorrhagia, intermenstrual uterine hemorrhages and dysmenorrhœa, singly or combined, are usually present.
4. Sterility, which may be due to coexisting lesions, is usually present.
5. Defecation and urination are commonly painful.
6. Reflex and sympathetic disturbances of extra-pelvic organs, especially the organs of digestion, and faulty general nutrition, are present in most cases.

Differential Diagnosis of Chronic Metritis.

The differential signs are between metritis, small fibroid tumors, and early pregnancy.

Chronic Metritis.	Small Fibroid Tumors.	Early Pregnancy.
1. Menorrhagia and intramenstral uterine hemorrhages not invariable.	1. Menorrhagia and uterine hemorrhage, the rule.	1. Amenorrhœa.
2. No signs of pregnancy.	2. No signs of pregnancy.	2. Signs of early pregnancy: *a.* Morning sickness. *b.* Breasts enlarged. *c.* Blue discoloration of vaginal mucosa. *d.* Softening of the cervix uteri.
3. Uterus hard and regular in outline.	3. Uterus hard and irregular in outline.	3. Uterus soft and regular in outline; may momentarily contract and harden on handling.
4. Uterus commonly in pathological anteversion and descent; may be in retroversion.	4. Uterus liable to be displaced in any direction according to the mechanical influence of the fibroids.	4. Uterus commonly anteverted.

The least doubt as to the existence of pregnancy should lead one to await developments. Under no circumstances should the sound be passed if pregnancy is a possibility.

Treatment of Chronic Metritis.

The treatment of chronic metritis is that of the associated lesions. The reader is referred therefore to the treatment of endocervicitis, endometritis, perimetritis, parametritis, and inflammation of the uterine appendages.

CHAPTER XIX.

PELVIC INFLAMMATION.

Routes of Infection. General Etiology and Significance of Pelvic Inflammation.

INFLAMMATION of the uterus, as outlined in the preceding chapter, may extend to the surrounding lymph-channels, veins, cellular tissue, Fallopian tubes, ovaries, and peritoneum. The subject of pelvic inflammation therefore includes lymphangitis, phlebitis, cellulitis, salpingitis, ovaritis, and pelvic peritonitis.

Routes of Infection.

Since the source of circumuterine infection is usually endometritis, it follows that the routes by which it passes to the outlying structures must often lead from the endometrium. Two routes have already been outlined, one by continuity of uterine and tubal mucosa; the other by the lymph-vessels and blood-vessels of the uterine muscularis and of the para-uterine connective tissue. See Chapter X.

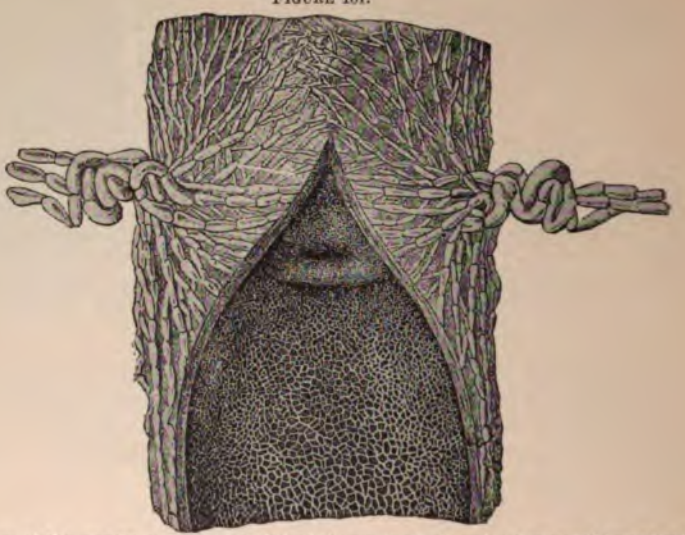
Transmission by continuity of mucosa does not invariably involve all the epithelial surfaces over which the infection has passed. It is probably possible, although not usual, for infection to travel from the endometrium to the abdominal end of the tube without intervening infection of the uterine end. Even though the uterine end has been infected, it may, owing to its smoother surface and greater resistance, have recovered, leaving the disease only at the abdominal end.

The lymph-channel may be the mere carrier of infection, and may itself show no trace of inflammation, or it may be inflamed throughout; this is because the bacteria by whatever route carried may colonize only at points of least resistance; freedom from infection in the vessels therefore does not prove that infection has not passed through them.

A third route of infection from extra-pelvic organs is illustrated by the cases of Binkley[1] and Robb.[2] Binkley's case was purulent salpingitis following purulent appendicitis, a sequence frequently observed. Tubercular peritonitis[3] often extends to the tube, ovary, and uterus. In very rare cases it originates in the cervix uteri and reaches the ovaries and tubes from that point.[4]

[1] Binkley. Cincinnati Lancet and Clinic, March 31, 1895.
[2] Robb. Johns Hopkins Hospital Bulletin, No. 20, 1892.
[3] Hegar. Genital Tuberculose der Weiber. Stuttgart, 1896.
[4] Williams. Johns Hopkins Hospital Report, 1892.

FIGURE 161.



Lymphatics of the cervix and upper third of the vagina.[1] See also figures of lymphatics in Chapters XIII. and XXVIII.

Etiology of Pelvic Inflammation.

Since extra-uterine pelvic infection usually originates in the endometrium, the causes will for the most part correspond with those of endometritis; it may arise also from the intestines, bladder, peritoneum, vagina, or from the general circulation, as a sequel of the acute infectious diseases. Pelvic hæmatocele may become the seat of infection and be the predisposing cause of a pelvic abscess. See Tubal Pregnancy.

Laceration of the perineum and cervix, and other traumatisms of parturition and of surgery, may open the way for the entrance of infection through the blood- and lymph-channels. The puerperal and traumatic infections more frequently take this route. Infection of lymph-vessels and bloodvessels may be carried to the uterine appendages from external cervicitis. One of the most frequent modes of infection is by uncleanly operations, local treatments, and examinations.

The micro-organisms of infectious diseases, which have been quite generally found in the genitals, are introduced most frequently by uncleanly operations, local treatment, and examinations. Chief among these micro-organisms are the following:

Gonococcus.	Klebs-Löffler bacillus.
Colon bacillus.	Typhoid bacillus.
Tubercle bacillus.	Pneumococcus.
Streptococcus pyogenes.	Actinomycosis.

Staphylococcus pyogenes albus, citreus, and aureus.
Bacillus of malignant œdema.

[1] After Poirier, in Pozzi. Treatise on Gynecology.

Significance of Inflammation.

Circumuterine inflammation involves diverse changes in the Fallopian tubes, ovaries, pelvic peritoneum, lymphatics, lymph spaces, veins, and pelvic cellular tissue. Infection of the Fallopian tubes or ovaries may have the closest relation with infection of any or all of these structures. In this connection it is essential to grasp not only the nature and anatomical results, but as well the significance of the inflammatory process. The greatest danger is not from the inflammation, but from the infection. Inflammation is an effort of nature to defend the general system against infection. Chapter X. If the infection has passed by continuity of surface through the tube, it no sooner reaches the pelvic cavity than the peritoneum attempts to protect itself from further invasion by prompt closure with inflammatory adhesions of the abdominal opening of the tube. The uterine end may likewise be closed, and the poison thereby shut off also from the endometrium.

When the infection has reached the pelvic cavity and produced peritonitis, the inflammatory process may promptly confine the poison by thrombic plugging of the vessels, or the lymph effusions may be shut off by peritoneal adhesions and a protective wall be formed; in case neither of these processes takes place, the infection will speedily involve the whole peritoneum, and its poisonous products will be rapidly increased and poured in fatal quantities through the broad peritoneal surfaces into the general circulation.

We are familiar with the profound depression of the nervous system, the continued nausea, the anxious facies, the paretic and distended bowels, and the tympanites, which go to make up the symptom-group of peritonitis. These grave symptoms are attributed wrongly to peritonitis; they are rather the result of the profound ptomaïne poisoning which the peritonitis is striving, perhaps unsuccessfully, to shut off from the general circulation.

When the infectious poison starts from the endometrium and goes forward by way of the lymph channels or veins in the cellular tissue of the broad ligaments, these vessels may simply transmit the poison to the peritoneum, tubes, or ovaries, and themselves escape infection; or the course of the poison may be arrested by thrombic plugging of the vessels and by consequent extensive and destructive perilymphangitis or periphlebitis. The result may be an almost overwhelming pelvic cellulitis. The inflammation may be for the most part confined and the poison may spend its force within the limits of the cellular tissue of the broad ligament. The destructive process in the tissue may be so great as to end in permanent impairment of the pelvic nutrition and in chronic invalidism; but the pelvic cellular tissue has taken the brunt of the poisonous attack, sacrificed itself, and perchance saved the life of the woman. See the following chapter on Pelvic Cellulitis.

CHAPTER XX.

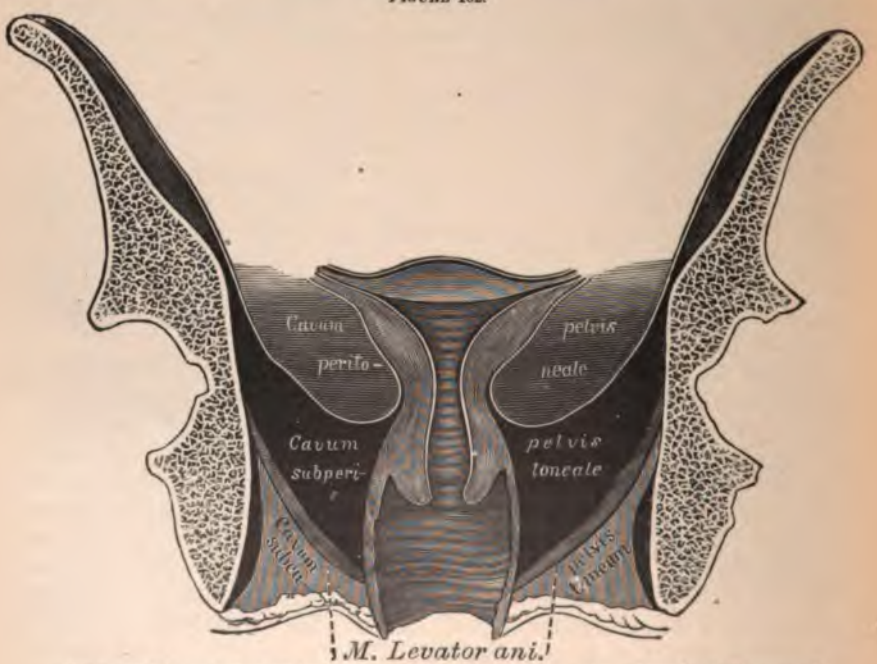
PELVIC CELLULITIS.

BEFORE reading this chapter on cellulitis the student is requested to consult the previous paragraphs on the Significance of Inflammation.

Anatomy.

An abundance of loose *cellular tissue* binds all the pelvic viscera together. It is continuous with the cellular tissue of the uterus and its appendages, and is found in large quantities especially in the broad ligaments; it is the medium through which the lymph-

FIGURE 162.



Three divisions of the pelvic cavity—viz., peritoneal, subperitoneal, and subcutaneous.[1]

and bloodvessels, and nerves connect the uterus with its appendages, and bring them all into close anatomical, physiological, and pathological relations. The cellular tissue, and particularly that of the broad ligaments, becomes therefore a most significant factor in pelvic infection.

[1] After Fehling. Lehrbuch der Frauenkrankheiten.

Exception has sometimes been taken to the name cellulitis, since all tissues are made of cells, and since therefore, in the wide sense, all inflammation is cellulitis. The word is used here in accordance with the established usage, and is limited to inflammation of the cellular tissue around the uterus and vagina, more especially that between the folds of the broad ligaments. The term parametritis is too restricted, since the disease may occur in the lower regions of the pelvis around the vagina and bowel. Cellulitis bears somewhat the same relation to peritonitis as pneumonia bears to pleuritis—that is, it is associated usually with a variable degree of peritonitis.

Etiology.

Parametritis, or, as it commonly is called, pelvic cellulitis, is usually of puerperal origin. Its causes therefore are largely identical with those of puerperal infection. The etiology in general is considered in Chapter X. The gonococcus has been found in connective tissue. Hegar has observed it in the lymph vessels of the parametria. The most frequent bacteria in cellulitis are the common pus cocci. The source of the infection is usually the inflamed uterus; but it may start from the perineum, vagina, bladder, or rectum. The rectum, urethra, and bladder are frequent sources of cellulitis in men. It may be due also to unclean therapeutic appliances, such as tents, and pessaries, and to septic manipulations generally. Traumatisms, especially those of parturition, open the way for the entrance of the bacteria. Although cellulitis most frequently occurs as the result of puerperal infection, it is confined by no means to that state. The bacterial causes are the same as those given in the foregoing chapter on Pelvic Inflammation.

Pathology and Pathological Anatomy of Pelvic Cellulitis.

The disease may affect not only the cellular tissue in the broad ligaments, producing parametritis, but sometimes the utero-sacral or utero-vesical cellular tissue. Occasionally the disease encircles the uterus and is then called circumuterine cellulitis.

Cellulitis reaches the cellular tissue by way of the lymph channels or veins, and is primarily therefore a lymphangitis or phlebitis. The lymph spaces have no walls save the cellular tissue around them; inflammation of this tissue must be cellulitis. When infection is travelling by way of the lymphatic vessels and veins, which do have walls, and inflammation results, it will first be in the walls. An early attempt is made to check the spread of the disease by thrombosis. Destruction of the walls of the vessels may follow. The inflammation will then spread to the surrounding structures. This would be perilymphangitis or periphlebitis. The tissue around the vessels, however, is cellular or connective tissue. The disease in its full development is therefore cellulitis. Hence to define cellulitis as perilymphangitis or periphlebitis might be strictly accurate.

The cellular tissue of the pelvis binds the various organs together and fills nearly all the space in the pelvis not occupied by them; it exists in great quantities around the uterus, vagina, rectum, bladder, and the psoas and iliacus muscles, and furnishes an abundance of material for the development of cellulitis.

Cellulitis, like other inflammations, is divided into three stages: 1, congestion; 2, effusion; and 3, suppuration. The disease may terminate with either of these stages. Successful abortive treatment may arrest it in the congestive stage. If it goes to effusion, it may end in resolution and complete recovery, or continue as chronic cellulitis, or go on to suppuration and form a pelvic abscess.

The blood and lymph vessels here and there are plugged with firm inflammatory thromboses. If resolution does not follow, the thromboses break down and the corresponding places are filled with pus. The infection spreads from these small collections, which are, in fact, small abscesses, and frequently leads to the formation of single or multiple abscesses in the broad ligaments. These abscesses creep along the meshes of the loose connective tissue, avoiding the firmer and stronger parts, and unless opened by incision burst into the vagina, bladder, urethra, or intestine, or above Poupart's ligament, rarely below it, or into the labia majora, peritoneum, or lumbar region, or through the obturator, sacro-sciatic, or saphenous openings. Abscesses of cellulitic origin most frequently burst into the vagina; those of tubal origin, especially if surrounded by peritoneum, are more apt to break into the bowel or bladder. The bursting of an abscess through the cutaneous surface or into an organ which affords ready drainage may, if it does not cause fresh infection, be followed by spontaneous cure. The breaking of an abscess into the peritoneum may set up fatal peritonitis.

In very severe cases, with extensive invasion of the lymphatics, the whole cellular tissue of the pelvis may be involved in paracystitis, paracolpitis, paraproctitis, parametritis, salpingitis, and ovaritis. Such infections usually result in multiple abscesses and great systemic disturbance. It is known as the *erysipelas malignum internum* of Virchow, or *diffuse cellulitis* of Pozzi. There may also be extensive hemorrhages from destruction of the bloodvessels. The clinical picture in these cases is that of an acute general septicæmia. The infection may result in general peritonitis, and accumulations of pus may form throughout the abdominal cavity. The condition is rare and the rate of mortality high.

Formerly cellulitis was considered the central lesion in pelvic inflammation. Salpingitis, ovaritis, and peritonitis were scarcely recognized as surgical diseases. A great advance was made in practical pelvic pathology when Battey, Hegar, Tait, and others showed the vastly greater relative importance, from the surgical standpoint at least, of tubal inflammation. When purulent accumulations in the pelvis were commonly attributed to cellulitis, and were therefore left to themselves or treated by incision and drainage into the vagina, the failures were many and unexplained. As soon, however, as they were generally recognized as accumulations of pus in the Fallopian

tubes it was easy to understand why incision and drainage were so often followed by failure. It was because the tube is lined by mucous membrane and because chronic suppuration of mucous surfaces, even when drained, is most intractable. On the other hand, a cellulitis abscess surrounded by cellular tissue when emptied is apt to close spontaneously. Pelvic cellulitis therefore, unless complicated by tubal communication, either terminates rapidly by resolution with complete recovery, or, if suppuration occur, it empties spontaneously or is evacuated by incision, and like a furuncle, which it resembles, promptly disappears; hence the cellulitis abscess, unless of tubal origin, seldom becomes chronic, and therefore has little or no part in the more familiar chronic pelvic suppuration for which the uterine appendages and sometimes also the uterus have to be removed.

Clinical experience shows pelvic suppuration to be primarily almost always in the tube; rarely in the cellular tissue below; and if perchance an abscess be found there, it usually gives evidence of having burst from the tube into the broad ligament.

The above facts have led to a tendency of late years, especially among the laparotomists, to deny the existence of pelvic cellulitis, and to announce the triple proposition: that cases of extra-uterine pelvic inflammation are, except in rare instances of puerperal origin, essentially of tubal development; that ovaritis and peritonitis are always secondary to tubal disease; and that an abscess in the broad ligament is there only when a previous infection of the Fallopian tube has forced its way through the mesosalpinx into the parametrium. In this connection let us remember that the disease occurs in men, who have no Fallopian tubes. Why should the cellular tissue of the pelvis be free when the same tissue in every other part of the body is subject to infection? Would it not be just as reasonable to assume that pleuritis is the central lesion in all pulmonary infection, or that perinephritis is the essential factor in all cases of contracted kidney? The question, however, is not settled by *a priori* reasoning. Post-mortem studies prove the frequent existence of acute cellulitis abscess not only by rupture of a sactosalpinx into the parametric cellular tissue, but also by the direct lymphatic or venous route.

Pelvic cellulitis gives rise to numerous displacements and distortions of the pelvic organs, chief among which are:

a. Uterus drawn forward, backward, or to either side.

b. Ovaries and tubes displaced and fixed.

c. Bladder may be displaced or distorted.

d. Rectum rarely constricted.

Chronic Atrophic Cellulitis. There is a form of chronic cellulitis, described by Freund, characterized by atrophic changes analogous to cirrhotic disease in other organs.[1] This disease may originate in inflammation of the uterus, bladder, or rectum, and is especially apt to include chronic atrophic pericystitis and periproctitis—*i. e.*, inflammation of the connective tissue around the rectum and blad-

[1] Freund. Parametritis chronica atrophicans circumscripta et diffusa. Centralblatt für Gynäkologie.

der. This would cause contraction of these viscera and shortening of the vagina.

The atrophic contracted cicatrix-like cellular tissue may cause excessive versions and flexions of the uterus. Since, however, the symptoms would be due rather to the cirrhotic disease than to the uterine deviations, mechanical support would be of little or no value. Perineuritis; neuritis; destruction of blood and lymph vessels; pinching of the nerves, lymphatics, bloodvessels, and ureters by the contracting cellular tissue; pain; local malnutrition; a wide variety of reflex nervous disturbances; chronic invalidism: all these are among the results of the atrophic process.

In contrast with the chronic atrophic cellulitis of Freund, is the so-called cellulitis of Stapfer.[1] It consists of hard, œdematous indurations in the abdominal walls and in the walls and floor of the pelvis. The disorder is characterized by pelvic discomfort and pain. The pain is sometimes neuralgic in character, usually inconstant, transitory, and severe. The inflammation is of very mild type, with slight systemic disturbance. The transient nature of the disease suggests the analogy of urticaria and a probable angioneurotic element in its causation. Stapfer declares that the condition is common, and often mistaken for more serious affections.

Symptoms of Pelvic Cellulitis.

The symptoms are nearly identical with those of inflammation of the uterine appendages. The reader is referred therefore to that subject, especially when the inflammation is secondary to salpingitis or ovaritis, or is situated in the upper part of the broad ligament near the tubes and ovaries. When the disease is at or below the base of the broad ligament away from the uterine appendages the location of pain and swelling will correspond to that of the inflammation. In acute cellulitis there will be severe radiating pain, in many cases pain shooting down the thighs, high fever, chills, great local sensitiveness, inability to walk or stand, and painful urination and defecation. Acute symptoms may decrease, and when suppuration occurs reappear, modified by the signs of pus-formation—that is, chills and hectic fever.

Diagnosis of Pelvic Cellulitis.

The symptoms outlined in the foregoing paragraph would always suggest a tumor in the pelvis composed of products of inflammation, which, if present, may be felt as a hard, boggy mass usually in the lower portion of one of the broad ligaments, crowding the uterus to the opposite side of the pelvis and bulging into the vagina. Not infrequently the utero-sacral folds, so-called ligaments, are involved. When these folds are infiltrated, the inflammatory mass will be felt posterior to the uterus crowding the organ to the anterior part of the pelvis. Later, when resolution has taken place, contraction of the ligaments may result in retroversion or anteflexion. Post-uterine cellulitis is examined best by rectal touch. If the inflammation has progressed

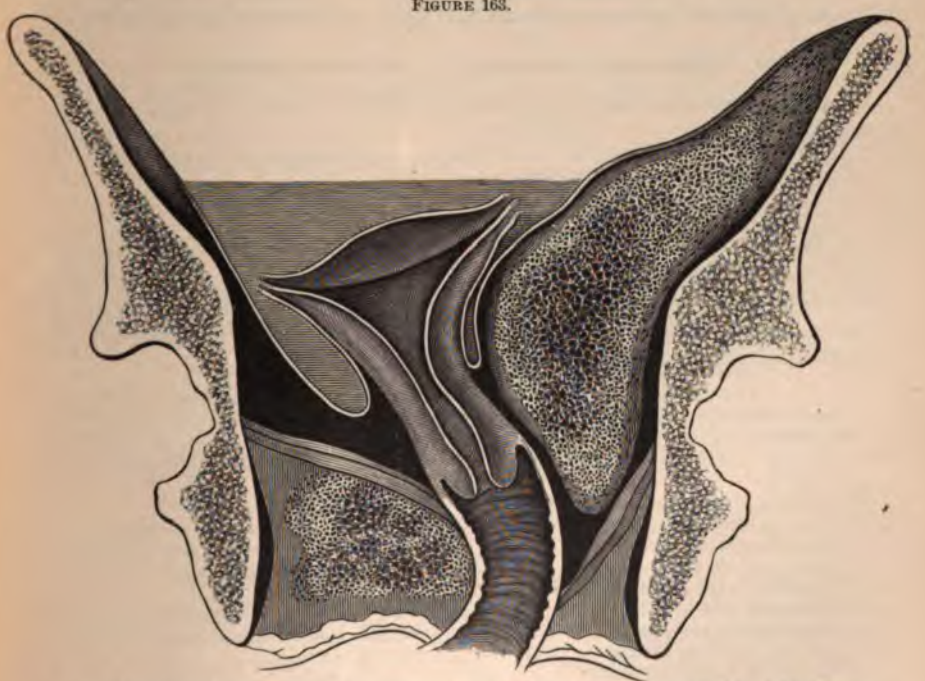
[1] Stapfer. Annales de Gynécologie, July, 1898.

to the third stage—that is, to the formation of an abscess—the inflammatory product, wherever situated, usually will give on digital examination the sensation of a boggy, fluctuating mass.

The diagnosis of pelvic cellulitis is determined by the presence in the pelvic connective tissue of an inflammatory exudate situated at some point adjacent to the uterus or to the upper part of the vagina. This exudate may be observed with reference to the following characteristics: 1, location; 2, form; 3, relations; 4, immobility; 5, consistency; 6, pain.

1. *Location.* The exudate may be situated,
   - *a.* On one or both sides of the uterus; if unilateral, it will crowd the uterus in the opposite direction and depress the lateral fornix of the vagina on the affected side.
   - *b.* Between the folds of the broad ligaments high in the pelvis, with a tendency to extend around the rectum.

FIGURE 163.



Parametritis. Exudate in left subperitoneal cavity, crowding corpus uteri to right. Paracolpitis in right subcutaneous cavity, crowding cervix uteri and vagina to left. This latter would produce a perianal abscess, and would usually be followed by fistula in ano.

   - *c.* In the post-cervical connective tissue, blocking up the cul-de-sac of Douglas and depressing the posterior fornix of the vagina.
   - *d.* In the connective tissue between the cervix uteri and bladder—very rare.
   - *e.* In all the connective tissue around the uterus—circumuterine cellulitis.

f. In the subcutaneous region, as shown in the accompanying figure, crowding the cervix uteri and vagina to the opposite side and having a tendency to produce a peri-anal abscess with resultant fistula in ano.

2. *Form.* The exudate will take the shape of the resisting structures by which it is limited, and therefore will vary in form from a round to an oblong, flat, or irregular mass; it may sharply be circumscribed or diffuse.

3. *Relations.* The exudate may surround or blend with neighboring parts, such as the rectum, cervix uteri, vaginal fornix, and bladder.

4. *Immobility.* The exudate usually is fixed, the degree of fixation increasing with the progress of the disease.

5. *Consistency.* The exudate, according to the location and resistance of surrounding structures and to the composition of it, may be soft and elastic, or hard and less elastic; it may contain pus or serum, and therefore may give rise to fluctuation.

6. *Pain.* Usually tenderness and pain are present, but not always.

Differential Diagnosis of Pelvic Cellulitis.[1]

Pelvic cellulitis has many characteristics in common with the following diseases:

Pelvic peritonitis,	Perityphlitic abscess, appendicitis,
Pyosalpinx,	Psoas abscess,
Pelvic hæmatocele,	Subserous myoma.

The frequent association of pelvic cellulitis with pelvic peritonitis and with salpingitis may render the differentiation most difficult. It is especially difficult when cellulitis and peritonitis coexist in puerperal cases. Early examination in most cases of cellulitis is so painful as to be impracticable without anæsthesia.

Pelvic Peritonitis.	Pelvic Cellulitis.
1. Uterus usually surrounded and fixed by an exudate.	1. Tumor usually at side of uterus.
2. Blocking up of the vaginal fornix all round uterus.	2. Bulging of one or both lateral fornices.
3. Tendency to suppuration not marked.	3. Great tendency to suppuration.
4. Pain severe and paroxysmal in acute stage.	4. Pain less severe and more continuous.
5. Mass rather high in pelvis.	5. Mass lower in pelvis and easily palpated.
6. Cervix usually fixed in median line with corpus in anteversion or anteflexion.	6. Uterus usually displaced laterally.
7. Frequently results in general peritonitis.	7. Not frequently so complicated.
8. Anxious facial expression.	8. Facial expression not characteristic.
9. Both legs flexed on abdomen.	9. One leg flexed.
10. Nausea and vomiting frequent.	10. Less frequent.
11. Exudate may extend to upper zones of pelvis.	11. More generally confined to lower zones.
Retro-uterine Peritonitis.	**Retro-uterine Cellulitis.**
1. Mass presents round, sharp outline, and may involve whole posterior surface of uterus.	1. Mass flat, diffuse, and usually limited by retro-uterine fold of peritoneum.
2. Uterus forced forward.	2. Cervix uteri forced forward.
3. Rectum pressed backward in median line.	3. Pressed to one side or backward.
4. Adhesions later binding posterior surface of uterus and fundus uteri to rectum.	4. Adhesions lower and nearer cervix uteri.

[1] These tabular statements of differential diagnosis have been adapted from numerous works on gynecology.

PYOSALPINX.	LATERAL CELLULITIS.
1. Situated to one or both sides of corpus uteri, or bound behind uterus in cul-de-sac of Douglas.	1. Situated low and blocking up vaginal fornices.
2. Sharply outlined, sausage-shaped.	2. Usually not sharply outlined, but flat and diffuse.
3. Limited mobility of mass.	3. Usually fixation of mass.
4. May fluctuate or be very hard and resisting.	4. Often hard and resisting before suppuration and fluctuation.
5. Usually bilateral.	5. Usually unilateral.
PELVIC HÆMATOCELE.	PELVIC CELLULITIS.
1. History of tubal pregnancy with sudden and alarming signs of internal hemorrhage.	1. History of infection.
2. No chill, fever slight or absent. May be subnormal temperature.	2. Chill with slight or high temperature.
3. Rapid development of tumor.	3. Slower development.
4. Tumor soft and doughy or fluctuating; later hard and may be elastic.	4. Tumor usually hard until suppuration.
5. Usually circumscribed mass.	5. Usually diffuse mass.
6. Exploratory puncture—blood.	6. Exploratory puncture—negative, serum, or pus.
PERITYPHLITIC ABSCESS, APPENDICITIS.	PELVIC CELLULITIS—RIGHT SIDE.
1, Onset—constipation, pain, fever, nausea, vomiting.	1. Onset—pain, fever, little or no nausea or vomiting.
2. Tenderness at McBurney's point.	2. Not present.
3. Exudate high—surrounds cæcum.	3. Low in right broad ligament or post-uterine connective tissue.
PSOAS ABSCESS.	PELVIC CELLULITIS.
1. Usually history and symptoms of tubercu losis.	1. Absent—history of non-tubular infection.
2. Spondylitis.	2. Absent.
3. No history of acute infiammation.	3. Usually acute at first.
4. Exploratory puncture—typical tubercular pus.	4. Ordinary pus or serum.
SUBSEROUS MYOMA.	PELVIC CELLULITIS.
1. Slow development.	1. Development more rapid.
2. No history of infection.	2. History of infection.
3. Contour of tumor—usually round, sharply circumscribed, intimately connected with the uterus.	3. More diffuse, not so intimately connected with the uterus.

Prognosis of Pelvic Cellulitis.

The prognosis in the acute form, uncomplicated by tubal disease, is good usually. The inflammation may terminate in speedy resolution. If abscesses form, there may be rapid and complete recovery after evacuation of the pus. When pus-tubes coexist, the removal of them may be necessary. The chronic atrophic cellulitis of Freund is obstinate for symptomatic and hopeless for histological cure.

Treatment of Pelvic Cellulitis.

Treatment of Acute Parametritis. The prophylactic, palliative, abortive, and surgical treatment is the same as that of Acute Metritis, Chapter XIV. When the disease is secondary to salpingitis, the treatment should be directed to the uterine appendages. If the source of the acute infection has been a wound made in a surgical operation

or in parturition, let the exposed surfaces be cauterized thoroughly. For this purpose, it may be necessary to remove the sutures from a repaired cervix or perineum. Should the source of infection be an infected endometrium, sharp curettage of the endometrium may be considered. See Chapter XIV. Avoid routine uterine treatment.

If an abscess forms, it should be opened and drained; the technique of the operation is the same as that described in the next paragraph for opening and draining a pelvic abscess.

Treatment of Chronic Cases. When acute symptoms subside, absorption may be hastened by the application of Churchill's tincture of iodine to the vaginal fornix and the inguinal regions, and by the hot-water vaginal douche, as described in Chapter IV. Small doses of calomel, one-twentieth of a grain three times a day, with saline laxatives to secure regularity of the bowels, are indicated strongly. Sitz-baths and hot fomentations are palliative and promote resorption. If an abscess forms, it should be opened promptly. When suppuration occurs early in the disease, evacuation of the pus is followed often by complete cure. Chronic suppuration indicates probable tubal disease, and therefore may require removal of the appendages. A pelvic abscess due to cellulitis alone usually is opened best through the vagina. The pus is easily made out by fluctuation, generally to one side of the uterus, and the presence of it may be verified by the aspirator or by a large hypodermic needle. The needle may then be used as a guide, and the opening enlarged by introducing the sharp-pointed scissors and spreading the blades; after the preliminary incision through the vaginal wall the remainder of the opening may, as described in Chapter XXIII., be made with the finger. The rubber tube or gauze drain may be inserted and the cavity packed with gauze. Should the surgeon evacuate a supposed pelvic abscess, and the disease prove to have been pyosalpinx or hæmatocele, no harm has been done, for such accumulations of pus, especially when acute, sometimes yield to the same operation of incision and drainage as advocated above for cellulitis abscess. Later, the tube, if necessary, be removed by abdominal or vaginal section. Drainage through the rectum is inaccessible for after-treatment, and favors reinfection of the abscess-cavity, and is therefore to be avoided. In this connection the reader is referred to the treatment of pelvic suppuration by incision and drainage—Chapter XXIII.

[illegible] numerous cases in which parametritis resulted in [illegible] described serum instead of pus in the cellular [illegible] are said to exist occasionally in considerable [illegible] aseptic aspiration results in radical cure;[1] [illegible] the fluid prove to be serum, and not pus, [illegible] drainage may be unnecessary. Pus, however, [illegible] corpuscular elements as to resemble pure [illegible] coagulation of the fluid therefore, to settle [illegible] of drainage, may be necessary at the

[illegible] Medical Sciences, April, 1877.

The treatment of chronic non-suppurative cellulitis—that is, the atrophic variety of Freund—is discouraging. The estimated value of sea-bathing, electricity, glycerin and tannin tamponade, vaginal and rectal douches, and painting with iodine, varies widely with different physicians. The author has not found such measures of great value. The chief reliance must be in local and general massage and in systemic treatment.

CHAPTER XXI.

INFLAMMATION OF THE UTERINE APPENDAGES—SALPINGITIS, OVARITIS, PELVIC PERITONITIS.

SALPINGITIS.

Salpingitis is inflammation of the Fallopian tube.

Normal Anatomy.

The Fallopian tubes are developed by that part of Müller's ducts above the round ligaments. The part below the round ligaments, together with the Wolffian ducts, converges to form the uterus and vagina. The tubes therefore are directly continuous with the uterus. The bifurcated uterus of the lower animals is a combination of these two organs. The mucous, muscular, and peritoneal layers of the uterus are directly continuous into and form the tubes. By analogy of uterine nomenclature these three layers of the tube are named from within outward, as follows:

1. The endosalpinx.
2. The myosalpinx.
3. The perisalpinx.

The tubes extend from the horns of the uterus outward on either side and follow a bending course along the upper border of the broad ligament to a variable length of from three to five inches. They are divided into three parts:

The isthmus.

The ampulla.

The fimbriated extremity.

The Isthmus—i. e., the constricted portion of the tube—starts from the endometrium at the horn of the uterus, runs through the uterine wall, and continues outward toward the lateral wall of the pelvis about one inch. The calibre of the isthmus at the uterine junction, *ostium uterinum*, is so small as scarcely to admit a bristle. This constricted portion, unless dilated by disease, would prevent an intra-uterine injection or secretion from entering the abdominal cavity. It also serves to protect the tube against infection from the uterus and the uterus against infection from the tube.

The Ampulla is the expanded portion of the tube, and easily admits the uterine probe. It runs from the isthmus backward and downward around the outer border of the ovary, and terminates in an expanded, trumpet-shaped part called the infundibulum.

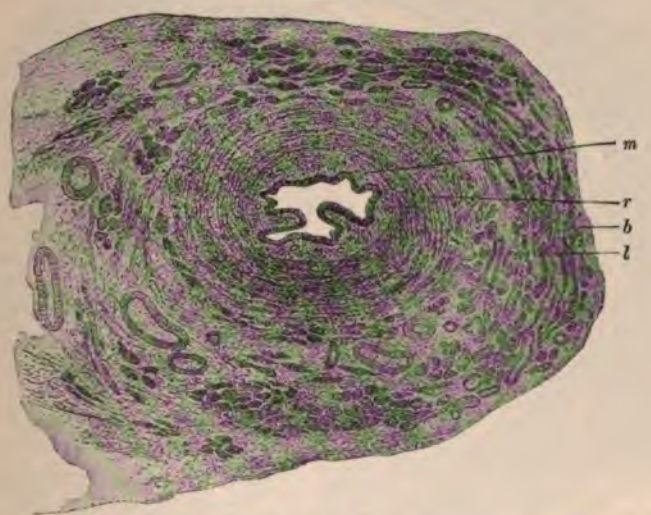
The Fimbriated Extremity at the abdominal opening is really the

termination of the ampulla. It is made up of irregularly shaped processes, all freely movable except one, which runs along the tubo-ovarian ligament and joins the ovary. These fimbriæ are branches from the high mucous folds of the endosalpinx.

The abdominal openings of the tubes are sometimes multiple, with more than one fimbriated extremity for a single tube.

The Endosalpinx, or mucous lining, continuous with that of the

FIGURE 164.



Cross-section of the normal Fallopian tube at the ostium uterinum. Hartnack Oc. 2, Obj. 2. *m*. Mucosa. *r*. Circular muscle fibres. *b*. Longitudinal muscle fibres. *l*. Subperitoneal connective tissue.[1]

uterus, is made of loose connective tissue covered with a single layer of ciliated columnar epithelium. The cilia are always directed toward the uterus, and probably serve to propel the ovum in that direction. The mucosa in the isthmus is relatively smooth; in the ampulla it rises in numerous high folds. This is abundantly shown in cross-section by Figure 165. The presence of glands in the Fallopian tube has been denied. Bland Sutton, after an extensive comparative study of the tubes of the lower animals and of woman, declares that the plications or folds of the tubal mucous membrane are disposed on the same principle as the glands in the uterus.

The probable function of the tubal folds is to provide an albuminous fluid for the ovum as it traverses the tube. The tube participates only in slight degree if at all in menstruation. As shown in ectopic gestation, it retains some power to develop the fertilized ovum.

The Myosalpinx is made of two muscular layers, internal circular and external longitudinal. These layers are continuous with the corresponding layers in the uterus. It is not known whether or not the tube has peristaltic power.

[1] August Martin. Krankheiten der Eileiter.

The Perisalpinx, or peritoneal investment of the tube, meets the mucous lining at the abdominal opening. It covers about four-fifths of the circumference of the tube, and, converging toward the broad ligament, forms a narrow mesosalpinx. Between the layers of the

FIGURE 165.

Cross-section of the normal Fallopian tube at the ostium abdominale. Hartnack Oc. 2, Obj. 2.[1]

mesosalpinx is an abundance of loose connective tissue through which the lymph-vessels and bloodvessels and nerves directly reach the tube.

Classification of Salpingitis.

The following varieties and phases of salpingitis are distinguished:

1. Catarrhal Salpingitis—Salpingitis Serosa.
2. Purulent Salpingitis—Salpingitis Purulenta.

Catarrhal salpingitis may result in:

Sactosalpinx serosa—hydrosalpinx.

Purulent salpingitis may result in:

Sactosalpinx purulenta—pyosalpinx.

If sactosalpinx is complicated by hemorrhage into the tube, it is called sactosalpinx hæmorrhagica or hæmatosalpinx; this is more common in serous than in purulent infections. Tubercular salpingitis, an especially important variety of purulent infection, will be described separately.

[1] August Martin. Krankheiten der Eileiter.

Etiology of Salpingitis.

The causes may be classified into: I., predisposing causes; II., exciting causes.

I. The predisposing causes are:

1. Abortion, labor, instrumentation, and manipulations.
2. Infections in neighboring organs which may reach the tubes by extension. Tubal disease is rarely primary.
3. Menstrual congestion, injudicious exercise at the beginning of menstruation, taking cold during menstruation, excessive coitus.
4. Acute exanthemata.
5. Visceral disease, as of the heart, lungs, liver, and kidneys.
6. Constitutional disease, such as syphilis, chlorosis, uric acid diathesis, gout, rheumatism, and cholæmia.

II. The exciting causes are bacterial, and are the same as those set forth in Chapter XIX., on Pelvic Inflammation in general.

General Pathological Anatomy of Salpingitis.

The pathology of catarrhal and purulent salpingitis presents many points in common. To some extent, therefore, one description will answer for both.

No sharp clinical lines of demarcation can be drawn between the inflammations of the different layers of the tube.

The infection usually passes to the tube from the endometrium, catarrhal endometritis giving rise to catarrhal salpingitis, and purulent endometritis to purulent salpingitis. Other possible routes of infection have been described in Chapters X. and XIX. Tuberculous salpingitis, for example, usually reaches the tube from above.

FIGURE 166.

Double hydrosalpinx.[1]

Endosalpingitis, whether catarrhal or suppurative, may extend beyond the tube in three different ways:

[1] Bandl, in American System of Gynecology.

1. If the abdominal end of the tube remains open, the secretion may flow out and infect the adjacent peritoneum and the epithelial covering of the ovary. The ovarian inflammation is then perioöphoritis. If, however, there be at the time a freshly ruptured Graafian follicle, the infection may enter the ovary and produce ovaritis.

2. The infection may pass through the walls of the tube by way of the lymph-channels and produce *perisalpingitis*—*i. e.*, inflammation of the peritoneal covering of the tube; thus local peritonitis may spread to the pelvic or even to the general peritoneum. All three layers of the tube, mucous, muscular, and serous, together with all the connective tissue of the tube, are now involved in a diffuse inflammation. The tube is greatly thickened, hard, and convoluted. Adhesions usually form between the serous covering and adjacent organs. The lumen may be partly or wholly obliterated. The secretions may be clear or clouded, catarrhal or purulent, and, unless the abdominal opening has been closed by swelling or by adhesions, may be forced into the peritoneum. This condition has been described under the names of *Interstitial Salpingitis* and *Diffuse Salpingitis*.

3. The infection may pass through the mesosalpinx into the loose connective tissue between the folds of the broad ligament. Under this condition perilymphangitis and periphlebitis may occur—*i. e.*, the cellular tissue around the lymph-channels and veins may become inflamed. This inflammation is pelvic cellulitis. A discussion of pelvic cellulitis and its relations to salpingitis may be found in the preceding chapter.

The second and third modes of extension are more likely to occur if the tube has become distended by pathological secretions, a common result of plastic occlusion of the two ends or of mechanical closure from swelling. Occlusion from swelling does not continue if recovery takes place; that from adhesive inflammation is usually permanent.

When the infection passes out through the abdominal opening of the tube, infection of the perisalpinx and adjacent peritoneum occurs. Adhesions then form between the tube and whatever peritoneal surface may be in contact with it. The ovary also may be in the region of the fimbriæ, and so glued to the abdominal opening as commonly to close the tube. Both tube and ovary then may be rolled [illegible] universally adherent in the posterior fold of the broad ligament. This condition is more common in the suppurative than in the [illegible] variety.

Catarrhal and purulent salpingitis may be either *acute* or *chronic*. The acute and chronic pathological changes shade off one to the other, and the difference between them is one rather of degree than of [illegible]. The pathology has already been described under [illegible] Routes of Infection, in Chapters X. and XIX.

[illegible] which produce the disease are much more frequently [illegible] acute than in chronic salpingitis. In chronic salpingitis [illegible] impossible to find them. Chronic accumulations of [illegible] are usually sterile—*i. e.*, the micro-organisms have [illegible] the pus is no longer infectious. It is said that the [illegible] the accumulation of their own products. The

escape of such sterile pus into the pelvic cavity from ruptured tubes during operation, or from any other cause, is not so dangerous as it was supposed to be when pus was considered always infectious.

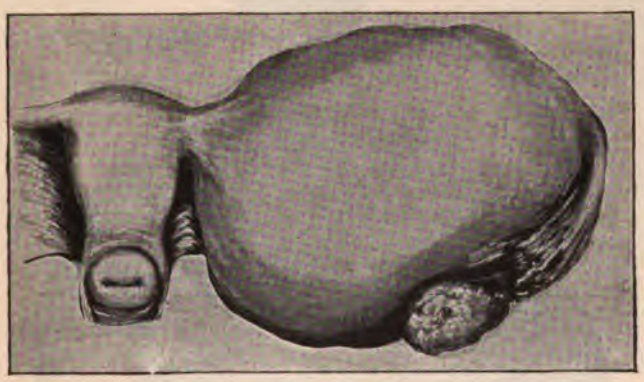
Sactosalpinx.

When both ends of the tube are closed either by swelling or by adhesive inflammation, and the walls become distended with the accumulated secretions, the disease is called sactosalpinx. Three varieties are distinguished, as follows:

Sactosalpinx serosa—hydrosalpinx.
Sactosalpinx purulenta—pyosalpinx.
Sactosalpinx hæmorrhagica—hæmatosalpinx.

The serous accumulation of catarrhal salpingitis is known as sactosalpinx serosa, or hydrosalpinx. A purulent accumulation is sactosalpinx purulenta, or pyosalpinx. Hæmatosalpinx, or sactosalpinx hæmorrhagica, is an accumulation of blood in the tube.

FIGURE 167.



Large hæmatosalpinx; semi-diagrammatic.[1]

Extensive and firm adhesions usually take place between the pus-tubes and the adjacent organs, especially the ovaries. Tubo-ovarian abscess or purulent tubo-ovarian cyst may form in consequence of such adhesions.

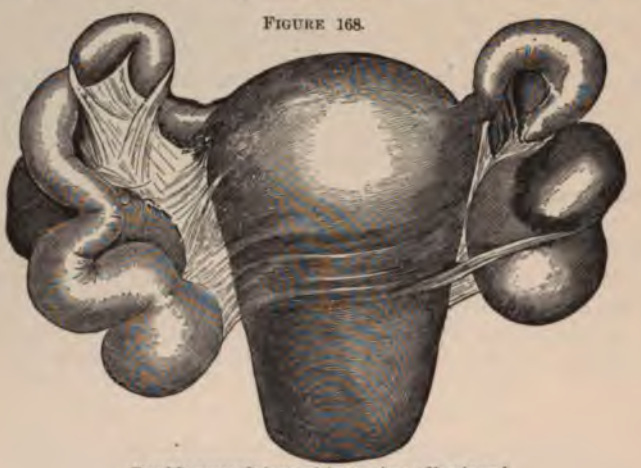
The odor of the pus is often very offensive, and, if the tube be adherent to the rectum, may be fecal.

Pus-sacs often burst into adherent organs—rectum, bladder, or intestine. Unlike cellulitis abscess, pyosalpinx does not often burst spontaneously into the vagina. The relief which comes from the rupture of a pus tube into an adjacent organ is apt to be temporary, for the pus usually reaccumulates. The escape of fluid from a hydrosalpinx or pyosalpinx into the uterus will be discussed under Salpin-

[1] Mundé, in Thomas and Mundé. Diseases of Women.

gitis Profluens. Hydrosalpinx in one tube and pyosalpinx in the other are not uncommon. Separate compartments, formed by occlusion of a tube at different points, may result in distention of these

FIGURE 168.



Double pyosalpinx with uterine adhesions.[1]

FIGURE 169.

Tubo-ovarian abscess. Abscess cavity in the ovary.

compartments with different fluids; hence there may be in the same tube hydrosalpinx, pyosalpinx, and hæmatosalpinx.

[1] Bandl, in American System of Gynecology.

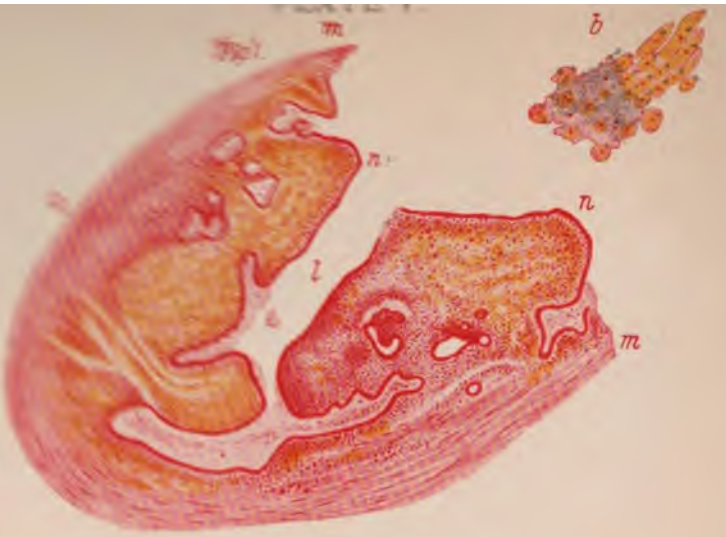


Fig.2

Fig.3

Figure 1. a, Salpingitis Catarrhalis Hemorrhagica, Cross Section. *m*, Muscle of the tube. *s*, Mucosa of the tube. *l*, Lumen of the tube. Picrocarmine stain. (Hartnack, Oc. 2; Objective 4.) *b*, Leucocytes containing blood pigment with normal red blood corpuscles from the tubal mucosa. (Hartnack, Oc. 2; Objective 7.)

Figure 2. Salpingitis Purulenta Acuta Dextra. *ou*, Uterine opening of tube. *oa*, Abdominal end of tube. *ov*, Right ovary. *f*, Purulo-fibrinous deposit. Posterior view, natural size.

Figure 3. Salpingitis Purulenta Chronica Dextra. *ou*, Uterine end of tube. *oa*, Fimbriated Abdominal end of tube. *ov*, Ovary with strongly adherent tube. Posterior View, natural size.

The distended tube often has the form of a pear. The narrow part toward the isthmus will correspond to the stem; the wide part will be the distended ampulla. In hydrosalpinx the fluid is clear, and in the absence of adhesions to the broad ligament the sac often is found freely movable in the pouch of Douglas.

Hæmatosalpinx may occur as the result of hemorrhagic salpingitis. The sac walls, especially if the hemorrhage be non-inflammatory, as in tubal pregnancy, are very thin and easily ruptured. The blood may or may not be mixed with tubal secretions, and if rupture does not occur may be absorbed.

Admixture with blood may occur in all forms of inflammation. An inflamed tube must contain blood in considerable quantities in order to be designated by the term *hemorrhagic salpingitis* or *hæmatosalpinx*. The latter, however, may occur without inflammation. The blood of hæmatosalpinx due to tubal pregnancy is always clotted; that due to salpingitis is often quite thick, and may resemble tar, but is not usually clotted.

Tubo-ovarian Cyst and Tubo-ovarian Abscess may form as follows: The adhesion of a sactosalpinx to a cystic ovary may be followed by the bursting of a small ovarian cyst into the tube and the establishment of a permanent communication between the two. During the farther growth of the tubal sac, which is now part of a tubo-ovarian cyst, the ovarian cyst is subject to the same pressure as the walls of the tube; hence the ovarian structure becomes flattened out so as to form a thin wall for the ovarian portion of the composite cyst, and thus the characteristic structure of the ovary is lost. This is not to be confounded with *ovarian hydrocele*. Tubo-ovarian cyst may occur in connection with either hydrosalpinx or pyosalpinx. If the sactosalpinx communicates with an ovarian abscess, this condition is called *tubo-ovarian abscess*.

Comparative Pathology of Catarrhal and Purulent Salpingitis.

Catarrhal Salpingitis.	Purulent Salpingitis.
1. Infection by extension from catarrhal endometritis.	1. Infection usually by extension from purulent endometritis; may be by extension from the peritoneum, as in tubercular salpingitis.
2. Essentially confined to mucosa—endosalpingitis. Walls of tube in acute stage slightly thickened; in chronic stage, more thickened. Complicating peritonitis not common.	2. Apt to extend and become diffuse, involving all layers of tube. Walls of tube very much thickened and infiltrated with round cells. Peritonitis common as a complication.
3. After acute stage, little or no pain or tenderness.	3. Pain and tenderness pronounced.
4. Tubal adhesions absent or less pronounced. Mobility and elasticity. Fluctuation through thin walls.	4. Adhesions usually extensive to cul-de-sac of Douglas, walls of uterus, broad ligaments, or posterior segment of pelvic floor; tube immobile and inelastic. Fluctuation masked by thickness of tubal walls.
5. Sactosalpinx will be hydrosalpinx—*i. e.*, tube distended with serum; sometimes hæmatosalpinx.	5. Sactosalpinx will be pyosalpinx—*i. e.*, tube distended with pus; pus may contain blood.
6. Abdominal end of tube usually closed by adhesions of fimbriæ; uterine end of tube less often closed.	6. Both ends of tube closed by adhesive inflammation.

CATARRHAL SALPINGITIS.	PURULENT SALPINGITIS.
7. Sactosalpinx may be due to occlusion of tube either from swelling of mucosa or adhesive inflammation: if the former, tube may periodically discharge contents into uterus or peritoneum, giving rise to colicky pains—*hydrops tubæ profluens, salpingitis profluens.*	7. Tube usually occluded by permanent inflammatory adhesions; hence, *salpingitis profluens* less frequent, although tube may rupture at times and discharge contents. Purulent salpingitis profluens is more dangerous than serous salpingitis profluens.
8. Folds of mucosa pressed together by fluid contents; epithelium disappears by pressure and folds grow together; deeper parts of inflamed mucosa may be partly or wholly shut off from lumen and form small cysts—*salpingitis follicularis.*	8. Folds of mucosa may be adherent or obliterated; lumen may be divided partially or wholly into spaces by constrictions or adhesions; these spaces may be distended by different fluids; hence the possibility of pyosalpinx, hydrosalpinx, and hæmatosalpinx in one tube with lumen composed of several cavities. Very much thickened walls of tube may contain small abscesses usually formed between adherent folds of mucosa.
9. Mucous folds may atrophy, become attenuated, and floating in the fluid have a wavy appearance described by Sawinoff under the name *salpingitis vegetans.* Lumen composed of one cavity.	9. Salpingitis vegetans never occurs.
10. Tube thinned and translucent in proportion to distention; walls atrophy; fimbriæ gradually lost. Tube moderately convoluted. *Size not usually larger than the finger; shape regular, spindle, round, elongated, or convoluted.*	10. Tube more and more thickened (irregular thickening) in proportion to distention, much convoluted and nodular; *size may equal that of a child's head; shape most irregular.*
11. Tube rarely ruptures and discharges contents into bowel, vagina, bladder, or peritoneum.	11. Such rupture and discharge not uncommon.

Symptoms of Salpingitis.

Ovaritis and pelvic peritonitis, although in a sense separate diseases, usually are related so closely to salpingitis that the symptoms and diagnosis of ovarian and peritoneal infections are included largely in those of salpingitis. Inflammation of the tubes and ovaries, taken as a whole, is designated sometimes as *adnexal inflammation*, or *inflammation of the uterine appendages.*

The symptoms of inflammation of the uterine appendages vary with the extent, virulence, acuteness, complications, and mechanical conditions of the disease. Usually the tubes are less sensitive to pain than the uterus and ovaries. The milder catarrhal inflammations, even though acute, may cause symptoms so slight as scarcely to fix the patient's attention upon the diseased part; they may even run their course and disappear, leaving no trace except perhaps greater liability to future infection. Such unrecognized mild congestive and catarrhal attacks of salpingitis are probably more frequent than is generally supposed.

Local pain or discomfort in the affected part does not always correspond to the seriousness of the infection. There may be only a dull aching or a sensation of burning not sufficient to impress the patient seriously unless aggravated by local pressure, by vaginal examination, by exertion, or by defecation, and yet the tube may be distended, ready to burst and discharge its poisonous contents into the peritoneal

cavity. The pain of salpingitis is always much increased when the disease includes peritonitis and ovaritis.

In a small minority of cases salpingitis is characterized from the beginning of the attack by very acute colicky pains in the region of the tubes, with intervals of comparative comfort. This symptom, from its frequency in prostitutes, has been called *colica scortorum;* it has been attributed to salpingitis profluens, to spasmodic contractions of the muscular wall of the tube or uterus, to peritoneal irritation, to leakage of tubal secretion, and to occasional rupture of the walls of the tube; there is no satisfactory explanation of this pain.

FIGURE 170.

Salpingitis pseudofollicularis.[1] Papillæ infiltrated with round cells. Folds of swollen mucosa have grown together, epithelium has disappeared, and deeper parts of inflamed mucosa have thus partly or wholly been shut off from lumen and formed small cysts—a not uncommon result of catarrhal salpingitis.[1]

During the monthly period the pathological congestion is supplemented by that of menstruation; hence the pains are increased and dysmenorrhœa is the rule. Increased menstrual flow, even to the extent of menorrhagia, is common. Amenorrhœa or scanty menstruation seldom is observed, and when present points to possible tuberculosis.

Greatly dilated and swollen tubes, especially when associated with local peritonitis, always produce mechanical disturbances. This is more marked when the swelling has been rapid. The more gradual

[1] Amann. Mikroskopisch-Gynäkologischen Diagnostik.

the swelling the more opportunity the parts have to adapt themselves to the new conditions. The mechanical symptoms are variable and numerous. They include painful urination and defecation, difficulty and pain on walking and standing, pelvic neuralgia, and many reflex symptoms referable to the cerebrospinal and digestive systems.

Comparative Symptoms of Catarrhal and Purulent Salpingitis.

Catarrhal Salpingitis.	Purulent Salpingitis.
1. Fever present in acute stage and usually absent in chronic stage.	1. Fever high in acute stage. Usually slight evening temperature in chronic stage. If pus becomes sterile, temperature may be normal.
2. Pain in region of tube variable in acute stage; usually absent or almost absent in chronic stage.	2. Pain and systemic disturbance (anxious facies, nausea, depression) more pronounced in acute stage. Pain and general malnutrition usually present in chronic stage. Symptoms partly due to extension of infection to neighboring organs, producing ovaritis, pelvic peritonitis, and cellulitis.
3. Salpingitis profluens not uncommon.	3. *Salpingitis profluens* uncommon.

Diagnosis of Salpingitis—Sactosalpinx.

The symptoms outlined in the foregoing paragraphs point to the probability of inflammation around the uterus. Indeed, it is usually easy to recognize the presence of acute pelvic inflammation, especially when the pelvic cavity is crowded with inflamed organs and with products of inflammation. The physical examination, however necessary to verify the diagnosis, will frequently not only fail to establish sharp diagnostic lines between inflammation of the different pelvic organs, but also between pelvic inflammation and other morbid conditions, such as tumors, with which the inflammatory mass may be confused. The subjective symptoms in the milder cases may wholly be overlooked. Indeed, the existence even of pyosalpinx is sometimes unrecognized until rupture of the tube and escape of pus have set up dangerous peritonitis. The presence of endometritis even should place one on guard against possible salpingitis.

In order to avoid the accidental rupture of a pus tube or abscess wall great care in the palpation of uterine appendages is imperative.

There is usually a recent or remote antecedent background of acute or chronic infection in some neighboring organ; the diagnosis therefore should include both the inflamed appendages and the antecedent causative inflammation, usually endometritis, but sometimes vaginitis, vulvitis, cystitis, proctitis, or appendicitis.

Among the subjective symptoms will be dull, often burning, constant, remittent, or intermittent pain and local tenderness. The colicky pains about the tubes, already mentioned under symptoms, are strongly diagnostic. Occasional exacerbations of local peritonitis from leakage of the tube or from other sources are characteristic of adnexal inflammation. In order to establish the diagnosis the symp-

toms already outlined must be supplemented by physical examination.

Physical Examination is by external palpation and conjoined manipulation. The former is usually inadequate. The latter, which includes external palpation, is made with the left index-finger in the vagina and the right hand over the hypogastrium; or, as set forth on page 59, with the left index-finger in the rectum, the thumb in the vagina, and the right hand over the hypogastrium. Light, conjoined palpation will show an irregular elongated swelling on one or both sides of the uterus, frequently extending into the pouch of Douglas, or even sometimes in front of the uterus. It is often impossible to make out the component parts of such a mass. They will, however, usually include the inflamed tube or tubes together, in varying degree, with diseased ovaries, peritoneum, intestine, omentum, bladder, and uterus. These structures may be matted together in an irregular, indefinite tumor. The one nearly constant factor in such a mass is sactosalpinx.

The Diagnosis of sactosalpinx depends upon the finding of a tumor connected with the uterus, sausage-shaped or retort-shaped, and tender on pressure. Gonorrhœa and tuberculosis are the two most frequent and significant forms of infection; it is therefore important to distinguish between them. *Gonorrhœal sactosalpinx will be recognized by:*

a. History of infection.

b. Presence of gonorrhœal infection in uterus, vagina, or vulva.

c. Bilateral infection; not invariable.

Tubercular Salpingitis. The disease is generally secondary to tuberculosis in other organs, and is of frequent occurrence. Whitridge Williams found it in 7.7 per cent. of ninety-one cases of removal of the uterine appendages. It very rarely occurs from direct infection by coitus or other media. It has been observed as early as the fifth year of life, and is the only form of salpingitis often found in virgins. It usually attacks both tubes and extends to the surrounding parts. Tubercular pelvic disease is characterized by mild pyrexia, weakness, often splenic enlargement, and thickening of the subperitoneal tissues. The tendency of the disease is toward atresia of the tube and the formation of pyosalpinx.

Tubercular salpingitis may be acute or chronic. The abdominal end of the tube is in general open in the acute and closed in the chronic cases; the contents of the tube, if closed, are serous, purulent, or caseous. The mucosa in acute cases may contain many small tubercular nodules. In these nodules are found few giant cells and many tubercle bacilli. Chronic tubercular sactosalpinx is often a large sac containing fluid or caseous pus. The mucosa is destroyed, and the sac is lined with granular tissue, which contains numerous giant and epithelioid cells. The tubercle bacillus in this tissue is often impossible to find. The perisalpinx presents the same microscopic appearances as the mucosa—that is, there are numerous giant cells and few if any tubercle bacilli. Chronic fibroid tuberculosis of the tubes is a peculiar form described by Williams. In this variety the forma-

tion of connective tissue is the final stage of the tubercular infection. The contracting fibrous tissue around the tubercular nodules crushes out the miliary tubercles and prevents spread of the disease.

Diagnosis of Tubercular from other Forms of Salpingitis. On account of the similarity of symptoms and physical signs the diagnosis may be very difficult. In comparison with the other forms, chronic tubercular infection is more apt to show an evening rise in temperature of about one degree, and a marked increase in the frequency of the pulse. Pain and menstrual disturbances are not particularly diagnostic. Ascites occurs in a small minority of cases and

FIGURE 171.

Tubercular Fallopian tube.

is diagnostic. The physical signs are substantially the same as in other forms of salpingitis. The chief diagnostic points are:

a. Tuberculosis in other organs; symptoms intensified.
b. Tuberculosis in husband.
c. Family history of tuberculosis.
d. Salpingitis in virgins; tubercular in 90 per cent. of all cases.
e. Presence of tubercle bacilli in leucorrhœa.
f. Scanty menstruation or amenorrhœa; not uncommon.
g. Ascites.

The Distinction of One Form of Bacterial Infection from Another must depend upon the examination of the secretions for bacteria. Such an examination is always desirable, but sometimes impracticable. The vulvo-vaginal and uterine secretions in the acute stage usually contain the causative germs. Pus long confined in the tube is apt to become sterile. This explains the freedom from infection so often observed after a pus tube has ruptured within the peritoneal cavity during an operation. The inflammation may continue long after the original germs have disappeared, or at least after their presence can no longer be demonstrated.

The differentiation of the various adnexal inflammations from one

another, especially in the acute stage, is often difficult. Ovaritis, usually a consequence, sometimes a cause of salpingitis, is not easily distinguished from it when the two organs are fused together by adhesions. When the tube is distended with fluid the difficulty is increased.

Differential Diagnosis of Salpingitis—Sactosalpinx.

The principal affections for which sactosalpinx may be mistaken are set forth in the following parallel columns:

Sactosalpinx.	Cystic Ovarian Tumor.
1. Commonly bilateral.	1. Commonly unilateral.
2. Tube oblong and tortuous.	2. Spheroidal or spherical.
3. Commonly adherent.	3. Less commonly adherent.
4. Ovary often palpated and distinguished.	4. Tumor is diseased ovary.
5. Usually not larger than fist.	5. May grow to enormous size.
Sactosalpinx.	**Solid Tumor of Tube.**
1. Common.	1. Rare.
2. Usually bilateral.	2. Usually unilateral.
3. Sensitive to pressure.	3. Not sensitive.
4. Usually fixed.	4. Usually free and mobile.
5. Elastic or fluctuating.	5. Firm consistency.
6. Result of infection.	6. Cause unknown.
Sactosalpinx.	**Pelvic Cellulitis.**
1. Usually sharply circumscribed and of rounded contour.	1. Not sharply circumscribed; may be flattened.
2. Commonly bilateral.	2. Commonly unilateral.
3. Elastic and fluctuating. Not a reliable sign.	3. Less elastic and fluctuating. Not reliable.
4. Position relative to uterus: mass usually higher in pelvis near fundus uteri; not connected with cervix. Vaginal vault not involved.	4. Position relative to uterus, usually lower in pelvis, often closely connected with uterus. Vaginal vault commonly depressed.
Sactosalpinx.	**Tubal Pregnancy.**
1. Mass usually elastic; may fluctuate.	1. Consistency often quite firm.
2. Adhesions common.	2. Less common.
3. Sensitive to pressure.	3. Not sensitive.
4. Uterine end of tube enlarged.	4. Commonly normal except interstitial tubal pregnancy.
5. History of infection.	5. History of pregnancy. *a.* Amenorrhœa. *b.* Increase in size of uterus. *c.* Enlargement of breasts. *d.* Morning sickness. *e.* Rupture of tube with great pain, collapse (pelvic hæmatocele), uterine hemorrhage, and discharge of decidual membrane.
Sactosalpinx (Right Side).	**Appendicitis.**
1. Tumor felt by vaginal touch.	1. Tumor not usually within reach of vaginal touch, but felt on external palpation in region of McBurney's point.
2. After acute stage, size of tumor may not materially diminish.	2. After acute stage, tumor apt to disappear.
3. Recurrence less dangerous and less frequent.	3. Recurrence more dangerous and more frequent.
4. More frequently of gonorrhœal or tubercular origin.	4. More frequently due to colon bacillus, less frequently of tubercular origin; never gonorrhœal, unless by extension from tube.

Among the other conditions which may in some respects resemble sactosalpinx are these:

Displaced uterus,	Displaced abdominal organs,
Tumors of the sacrum and ilium,	Adherent intestines,
Fecal accumulations,	Intestinal tumors.

Study of the diagnosis of *lateral and backward versions and flexions of the uterus*, in Chapter XLVI., and of Uterine Myomata, in Chapter XXVI., will enable the student to distinguish these conditions from sactosalpinx.

Tumors of the sacrum and ilium are distinguished by their location, hardness, immobility, and intimate relations with the bony pelvis.

Fecal accumulations may be recognized by palpation and may be removed by cathartics.

Displaced kidney, spleen, and other abdominal viscera, intestinal adhesions and intestinal tumors, may usually be recognized by their remoteness from the uterus, or by the fact that they may on manipulation be separated from that organ.

Anæsthesia is often necessary in order to make a satisfactory diagnosis and differential diagnosis of adnexal inflammation, and should be used in cases of doubt. Relaxation of the abdominal muscles under anæsthesia permits more efficient palpation with the minimum force, and consequently with the minimum risk. Many unnecessary laparotomies would doubtless be avoided by more careful diagnosis under anæsthesia. The more or less distended bladder or bowel has often been mistaken for a pathological collection of serum, blood, or pus; hence evacuation of the bladder and rectum is a prerequisite to examination.

Exploratory Incision. In serious pelvic disease the diagnosis, if not possible or satisfactory by the above means, may be made by exploratory vaginal or abdominal section. The incision may be the first step of a radical operation or, if the operation prove unnecessary, it may be safely closed. It is a good rule always to begin a peritoneal operation as a diagnostic exploratory incision. Mr. Tait wisely remarked, "It is better to turn an exploratory incision into an operation than it is to turn an operation into an exploratory incision.[1] The late Charles T. Parkes, whose early loss will not soon be replaced, when questioned by a bystander at the beginning of an abdominal section, replied, "I don't know what it is, and I am tired of guessing."

Prognosis of Salpingitis.

In acute adnexal inflammation the prognosis varies with the nature of the infection and with the extent of the disease. If the tube ruptures and discharges pus into the peritoneum, a fatal peritonitis may follow. If the infection is confined to the tube, the prognosis is usually favorable, but the removal of the appendages may be necessary for permanent recovery.

Simple catarrhal salpingitis and mild ovaritis may run their courses, perchance unrecognized, to recovery. They may even leave no trace behind save an increased liability to further inflammation. The

[1] Schauta. Centralblatt für Gynäkologie, p. 502, 1893.

more chronic the disease the less favorable the outlook for expectant treatment. Sactosalpinx, especially the purulent variety, rarely recovers without operative interference. This rule, however, is not without exception. Pus cavities may rupture spontaneously and discharge their contents through the bowel, uterus, bladder, vagina, or cutaneous surface, and recovery may follow; but such a possibility does not offer substantial hope of relief. In fact, even when such rupture and discharge are followed by relief the result is usually only temporary, and the patient may succumb to repeated infection.

Serous sactosalpinx, although little dangerous to life, may, by permanent closure of the tubes, cause loss of function and, if the disease is bilateral, sterility. Purulent sactosalpinx is a constant danger even to life. The gonococcus is less perilous to life, though probably more dangerous to health than the streptococcus. The streptococcus is apt to destroy the woman, while the gonococcus in a physiological sense destroys the reproductive organs and makes a chronic invalid.

The danger of operation varies somewhat with the extent of the disease, but chiefly with the kind of operation, the operator, and the nature of the causal bacteria. The mortality shown by some statistics is enormous; other reports give almost 100 per cent. of recoveries. The removal of a gonococcus sactosalpinx is less dangerous than that of a streptococcus sactosalpinx. This is especially true if the sac ruptures into the peritoneum.

One hundred and forty-four cases of removal of sterile pus tubes show a mortality of 2.8 per cent.[1] The average mortality, among the best operators, following removal of pus tubes is from 2 to 3 per cent. The operations in sixteen cases of gonococcus sactosalpinx in which the sac was removed intact show a mortality of 6.2 per cent.; in seventeen cases in which it burst during removal the mortality rises to 11.7 per cent. In another similar series the mortality was 8.35 per cent. and 11.1 per cent., respectively.[1]

It is evident from the above that the prognosis of the operation is favorably affected by the removal of the appendages without rupture and escape of pus into the pelvic cavity. The average mortality, however, with modern asepsis and technique is small, except for acute cases; usually these are treated more safely by vaginal incision and drainage.

Treatment of Salpingitis.

The treatment will be found in the two following chapters.

OVARITIS.

The abdominal end of the Fallopian tube is normally close to the ovary and communicates with it by the tubo-ovarian ligament. The utero-ovarian ligament connects the ovary with the uterus. Between the insertions of these two ligaments the ovary is joined to the posterior fold of the broad ligament by a broad base, the hilum, through which pass the lymphatics, bloodvessels, and nerves. Above the hilum the ovary is covered, not by peritoneum, but by germ epithelium, so

[1] Martin. Die Krankheiten der Eileiter.

called, which forms the Graafian follicles and from which the ova originate. The anatomy of the ovary will be considered further in the chapters on Ovarian Tumors.

Etiology of Ovaritis.

Adhesions between the tube and ovary, especially when recent, contain many lymph-vessels; hence, bacteria may have a short accessible route from the tube to the ovary. Accordingly, inflammation of the ovary is usually secondary to that of the tubes. It may, however, occur independently of salpingitis by extension from distant organs through the lymph- or bloodvessels or directly from the peritoneum. Among the bacterial exciting causes the most frequent are these:

1. Gonococcus.
2. Colon bacillus.
3. Streptococcus and staphylococcus.
4. Tubercle bacillus.
5. Pneumococcus.
6. Typhoid bacillus.

Modes of Infection.

The modes of infection are by the blood- and lymph-currents through the broad ligament or by continuity of tissue from the uterus, Fallopian tubes, bowel, or peritoneum.

Comparative Pathology of Acute and Chronic Ovaritis.

Acute Ovaritis.	Chronic Ovaritis.
1. Usually develops by extension from some adjacent organ.	1. Usually develops from acute ovaritis.
2. Ovary enlarged, tense, and elastic. Blood-vessels congested. Punctate hemorrhages. Surface on cross-section yellowish red and edematous. Adhesions form late or not at all. Exceptions: in gonorrhœal ovaritis adhesions form early.	2. Ovaries at first swollen and hard; later, surface uneven, nodular, and cystic. Cross-section shows numerous small cystic spaces. Tunica albuginea hard and scar-like. Adhesions from peri-ovaritis not uncommon.
3. Small-cell infiltration of stroma—interstitial ovaritis.	3. Interstitial connective tissue increased—interstitial ovaritis.
4. Vessels congested and tortuous.	4. Same.
5. Superficial epithelium degenerated and desquamated. Small hemorrhages, cellular infiltration, and suppuration about follicles. Follicular epithelium degenerated. Liquor folliculi becomes turbid from the presence of round cells and degenerated epithelium.	5. Superficial epithelium degenerated or absent. Small white bodies—*corpora albicantes*—and hemorrhages near follicles. Ovary becomes smaller from contraction of connective tissue. Great numbers of follicles may be filled with thick, turbid, bloody fluid or may become obliterated. This follicular disease is known as *micro-cystic degeneration*, and is a common result of ovaritis; see below. Tunica albuginea thickened and may be hyaline.
6. Infection of follicles from peritoneum or Fallopian tube.	6. Same.
7. Ovarian abscess may occur: *a*, in a corpus luteum; *b*, in the connective tissue; *c*, in the Graafian follicles. Non-gonorrhœal abscess usually unilateral, and not associated with pyosalpinx; infection usually travels through lymphatics in broad ligament. Gonorrhœal abscess usually bilateral and an extension of double salpingitis.	7. Same. See Tubo-ovarian Abscess and Tubo-ovarian Cyst under Salpingitis. Tubo-ovarian abscess found by Martin 18 times in 110 ovarian abscesses.
8. May rupture into peritoneum or into bowel or bladder.	8. Same.

Physical Signs of Ovaritis.

The physical signs of ovaritis are these:

1. Increase in size of ovary.
2. Tenderness and sickening sensation in ovary on digital pressure.
3. Displacement of ovary common, usually backward to cul-de-sac of Douglas, and consequent upon retroposition of uterus.
4. Ovary immobile, if adherent; mobile, if not adherent.

See physical signs of salpingitis.

Symptoms and Diagnosis of Ovaritis.

Mild ovaritis is commonly associated with catarrhal endometritis and salpingitis. Severe ovaritis is usually complicated with pelvic peritonitis and suppurative salpingitis.

Ovarian abscess is difficult to recognize; it is characterized by swelling and pain, and may give rise to general sepsis.

Microcystic degeneration is associated often with amenorrhœa, dysmenorrhœa, and sterility. See Chapters LIII. and LIV. The following symptom-group will aid in the diagnosis:

1. Pain located in ovarian region, radiating to back, thighs, ischiatic nerves, navel, and breasts.
2. Fever—not a constant or reliable symptom.
3. Nausea and vomiting—frequent.
4. Hemorrhage from uterus—not uncommon.
5. In severe septic cases of general pelvic infection local signs are masked.
6. Recurrence—usual in chronic cases.
7. Painful defecation and frequent urination.
8. Dyspareunia, hysteria.

In *chronic cases* the ovary is contracted and less painful on pressure. The general symptoms—*i. e.*, chill, fever, nausea and vomiting—are absent, and the history will show long-standing irritation and discomfort in the ovarian regions.

Differential Diagnosis of Ovaritis.

OVARITIS.	PELVIC PERITONITIS AND CELLULITIS.
1. In uncomplicated ovaritis inflammatory signs localized in ovary and sharply circumscribed.	1. Inflammation may involve whole pelvis—ill-defined.
2. Ovary usually mobile.	2. Ovary usually fixed.
OVARITIS.	**OVARIAN NEURALGIA.**
1. Ovary enlarged and tender.	1. Ovary may be normal.
2. Pain more or less constant.	2. Pain inconstant.
3. History of pelvic infection.	3. No such history.
OVARITIS.	**APPENDICITIS.**
1. Commonly bilateral.	1. Confined to right side.
2. Tends to localize in pelvis.	2. Tends to involve abdominal cavity.
3. Digestive disturbances secondary.	3. Primary.
4. Absence of tenderness at McBurney's point.	4. Usually present.
5. Inflammatory lesion deep in pelvis.	5. High in iliac space.
6. Inflamed organ recognized by size, form, and relation to Fallopian tube.	6. Ovary often recognized by bimanual examination as being separate and distinct from inflammatory area.

Treatment of Ovaritis.

The treatment will be found in the two following chapters.

PELVIC PERITONITIS.

Pathology and Description of Pelvic Peritonitis.

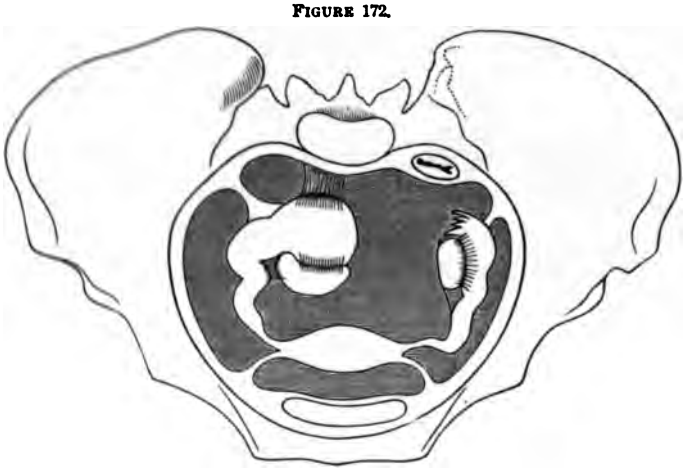
The two principal forms of peritonitis are:

1. Plastic or adhesive peritonitis.
2. Exudative peritonitis.

The two forms usually occur together. The plastic form, however, has been observed with little or no exudate. In addition may be mentioned tubercular peritonitis and pachyperitonitis.

Plastic or Adhesive Peritonitis. The formation of adhesions tends to shut off and localize the infection and to prevent it from extending to the general peritoneum; the infection is thereby limited not only in extent and quantity, but its force is spent within narrow limits. Within these limits the process may be very intense and the part may

FIGURE 172.



Right and left pyosalpinx. Right, adhesions between ovary and pus tubes and between pus sac and posterior pelvic wall. Schematic.[1]

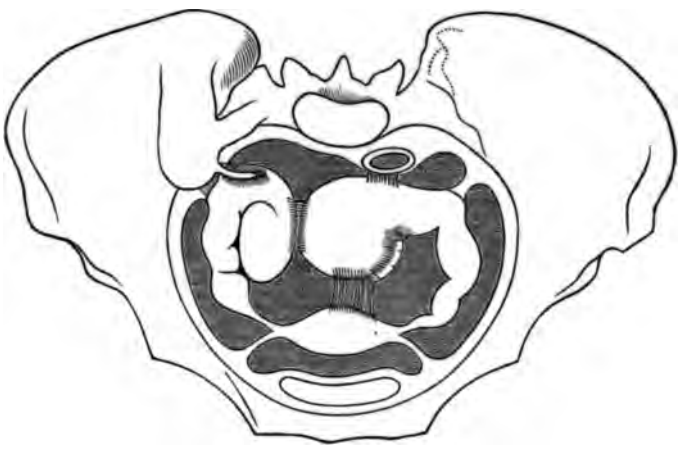
be sacrificed for the benefit of the whole. See remarks on Acute Inflammation and the Significance of Inflammation, in Chapters X. and XIX. The maximum of exudate with the minimum of defensive adhesion is dangerous; conversely, the minimum of exudate with the maximum of adhesion is relatively safe. Adhesions may slowly be broken up by movements of the intestines and by absorption, or they may become firm and permanent; hence the organs may strongly be matted together, with resultant displacement, stenosis, stricture, occlusion, and kinking; then peristalsis is impeded and nutrition suffers.

There may be at different points accumulations of pus walled off from the general peritoneum by adherent intestines and other viscera. If the peritonitis becomes general, it is usually fatal. The strong

[1] Martin. Die Krankheiten der Eileiter.

tendency, however, is to protect the general peritoneum by adhesions between the peritoneal surfaces around the inflamed area, and thereby to limit the disease. See Localized Infection, Chapter VIII.

FIGURE 173.



Right and left pus tubes adherent to one another. Right tube adherent to vermiform appendix. Left tube adherent to uterus and rectum. Schematic.[1]

Pelvic peritonitis usually begins with perimetritis or perisalpingitis, the infection having reached the peritoneum from the uterine or tubal mucosa. Sometimes the origin is extra-pelvic; in such cases the uterus and uterine appendages may not be involved. The disease, especially in connection with gonorrhœal salpingitis, is very common. The frequent recurrence of acute local exacerbations furnishes a familiar indication for the removal of the uterus and the uterine appendages.

The exudate consequent upon infection of the peritoneum may be serous or purulent; it may or may not be mixed with blood. Protective adhesions often include numerous partitions through the infected parts; hence several distinct collections of fluid may be formed. These collections are sometimes serous in one part, purulent in another; the whole may form a tumor filling the pelvis and the lower part of the abdomen, and having the appearance and many of the physical signs of an ovarian cyst.

The fluid may be absorbed or may break into a neighboring organ. In the latter way communications may be formed between the pelvic cavity, and the bowel, bladder, or vagina. Sometimes the pus finds its way to the cutaneous surface. Accumulations are most frequent in the pouch of Douglas. The microscopic findings show a few round cells in the serous, numerous pus-cells with a few red blood-corpuscles in the purulent, and numerous white and red blood-corpuscles in the hemorrhagic collections.

Exudative Peritonitis is the result of infection which does not

[1] Martin. Die Krankheiten der Eileiter.

strongly tend to provoke defensive action, and is therefore more liable than the plastic variety to become general; for this reason it is more dangerous.

Tubercular peritonitis is of frequent occurrence, and usually is characterized by small, sometimes minute, pearly tubercles or points scattered over the peritoneum.

The essential *cause* is the bacillus tuberculosis. The source of the infection is usually tubercular ulceration of the bowel, general tuberculosis, or localized tuberculosis of the Fallopian tubes or other pelvic viscera. The disease is rarely primary.

The *pathology* differs from that of ordinary peritonitis in the following particulars:

1. The perineum is studded with miliary tuberculosis, of which the tubercles may appear large and caseous.
2. The fluid exudate (serous, hemorrhagic, or purulent) appears later, and in numerous places may be encysted.
3. The peritoneal viscera usually are matted together by adhesions.
4. The mesenteric glands may be enlarged and palpable.
5. The bowel may become perforated or obstructed.

Pachyperitonitis. Oftentimes the peritoneum is much thickened and supplemented by the formation upon its surface of new membrane, which gives it a leathery appearance. The vessels in this new membrane early rupture with circumscribed hemorrhage. This is called *pachyperitonitis.*

Symptoms of Pelvic Peritonitis.

The symptoms in the acute stage vary irregularly with the extent of the disease. They may be slight or absent; or may include great pain, nausea, fever, abdominal distention, retraction of the thighs, anxious facies, and great nervous depression. The greater the tendency of the peritonitis to become general the more aggravated will be the symptoms. The symptoms, however, are sometimes altogether disproportionate to the gravity of the infection. Suppurative salpingitis, especially rupture of a pus tube, is most likely to cause dangerous peritonitis. The greatest discomfort, pain, and disturbance of function in the pelvis, especially about the rectum, uterus, and bladder, may come from mechanical causes, such as tension on bands of adhesion and pressure and traction upon the inflamed peritoneum.

Sterility in these cases is explained by the hostile influence of the secretions of the inflamed tube upon the impregnated ovum or spermatozoa; or, if the tube has closed, by the mechanical interruption of their passage through it; or by the failure of the Graafian follicle to rupture through the thickened, tough, chronically inflamed ovarian cortex.

The *distinctive symptoms of tubercular peritonitis* are: 1, gradual onset; 2, diffuse, not severe, pain in the abdomen; 3, febrile condition irregular; 4, rapid, often irregular, pulse; 5, constipation or diarrhœa, with meteorism; 6, sweating, general malaise, relapses, and remissions.

The *special local signs of tubercular peritonitis* are: 1, enlargement of the abdomen; 2, local or general tenderness on pressure; 3, mesen-

tery glands sometimes palpable; 4, dulness on percussion over involved areas.

Diagnosis and Differential Diagnosis of Pelvic Peritonitis.

The diagnosis and differential diagnosis have substantially been given under Pelvic Cellulitis, Salpingitis, and Ovaritis.

Treatment.

The treatment of pelvic peritonitis will be found in the two following chapters.

CHAPTER XXII.

NON-SURGICAL TREATMENT OF SALPINGITIS, OVARITIS, AND PELVIC PERITONITIS.

THE non-surgical treatment of inflammation of the uterine appendages is:

1. General.
2. Local.

1. General Non-surgical Treatment.

The treatment of the milder adnexal inflammation, when early recognized, is largely the same as that of the causative endometritis. Quiet, frequent rest, judicious active and passive exercise, avoidance of sexual excitement, regulation of the bowels, nutritious and non-stimulating diet, and the prohibition of tea and coffee in neurotic cases, are among the routine measures. Repeated examinations and treatments, especially rough palpation of a sactosalpinx, may, as stated under Diagnosis, prove dangerous.

Medical Treatment.

In acute cases pain may be relieved by opium and its derivatives: but they mask the symptoms and check the secretions, and are therefore in a degree contraindicated. The occasional practice of locking up the bowels and preventing peristalsis by the free use of opium has largely been abandoned. On the contrary, rather active elimination through the bowels and kidney has become the more accepted practice; [illegible] non-constipating palliatives usually are substituted for opium. [illegible] coal-tar derivatives, chloral hydrate, hyoscyamus, and [illegible] are among the more useful and least objectionable. [illegible] sulphate repeated in half-grain doses is perhaps the [illegible] of the preparations of opium. Should the nervous [illegible] and demand the more dependable morphine, [illegible] may be overcome by the addition of an equal [illegible].

[illegible] well secured by means of rectal enemata [illegible] sulphate, glycerin, or spirit of turpentine, as [illegible] VIII., or, if positive purging be required, by [illegible] cathartic. One may use to advantage repeated [illegible] grain in each, followed by Rochelle salt, [illegible] or some other appropriate saline. The [illegible] cathartic and diuretic. When the stomach will [illegible] cathartics, a grain of calomel may be put upon

the tongue every hour until the bowels act. A very high, retained enema of four ounces of the saturated solution of magnesium sulphate often gives prompt relief.

There is a form of chronic bilateral adnexal disease which scarcely goes beyond irritation and congestion. This is referred subjectively to the region of the ovaries. It is quite common among nervous, overwrought spinsters and girls, is usually associated with nervous irritability, is sometimes transient, often intractable, seldom dangerous.

Overwork and overexcitement from study or social requirements, and especially music,[1] by the physical strain of practice and by the power of music to excite the emotions at the developmental period of puberty, are potent and, among the higher classes, common causes of ovarian irritation. Many a hopeless neurotic invalid may in mature life date her invalidism from mental and emotional strains at the time of puberty.

The treatment of the somewhat intangible irritation outlined above is mainly hygienic and moral, and largely, therefore, belongs to internal medicine. It should, however, be rather regulative than medicinal. Unsatisfied sexual requirements, conscious or unconscious, demand that the attention be drawn away from the reproductive organs. If the patient has reached the proper age, marriage may be indicated. Otherwise let there be a change of environment and promotion of new interests. A careful, all-around examination may show some causal and removable extra-pelvic fault in the patient or her environment. There will often be found disturbance of the heart, liver, or kidney, or intestinal indigestion; such disorders may explain the impeded circulation upon which the ovarian irritation largely depends. There is usually an associated mild endometritis, which yields, if at all, to systemic treatment. The useless sacrifice of countless ovaries in this class of cases is a reproach to surgery. Menorrhagia, a frequent result of this condition, is well treated by ergot, preferably given in rectal suppositories, five to ten grains every eight hours until the flow is controlled.

Skene recommends for menorrhagic and neurotic cases the continued use of the fluid extract of hydrastis in thirty-drop doses, and, as needed for nervousness and sleeplessness, twenty to thirty grains of sodium bromide, to be given well diluted at bedtime, and repeated if necessary.[2]

The medical treatment not only of the above form of ovarian irritation, but of chronic adnexal inflammation in general, includes the judicious use of tonics, laxatives, alteratives, and hypnotics. It must conform to the general principles of internal medicine, and differs in no essential point from the general treatment of the extra-pelvic inflammations.

Local Non-surgical Treatment.

Reposition and retention of the displaced uterus by mechanical support may open up the collapsed uterine or tubal canal, secure

[1] Lawson Tait. Diseases of the Ovaries, p. 90, 1883.
[2] Medical Gynecology, p. 230.

drainage of retained secretions, and by overcoming traction on the bloodvessels may relieve congestion. The prime indication to restore the balance of circulation is therefore often fulfilled by mechanical support. Special attention, however, is directed to the contraindications of the pessary, as laid down in Chapter XLVII.

Catheterization, probing, and direct treatment of the Fallopian tubes through the uterus have been proposed, and may, perhaps, when these organs are dilated by disease, be possible; but the procedure is useless and dangerous.

Cold-water coils or the rubber ice-bag applied to the abdomen, the application of a large blister to that part of the hypogastrium which lies over the seat of maximum pain, and the free use of leeches, are very serviceable, especially in the abortive treatment of acute cases. At least eight leeches should be applied: one or two are useless.

The local treatment of chronic adnexal inflammation has for its chief object the quickening of the pelvic circulation and the promotion of absorption of morbid products. It includes: 1, the hot-water vaginal douche; 2, the vaginal tamponade of lamb's wool saturated with glycerin or glycerin and ichthyol; 3, the hot hip-pack; 4, electricity; 5, massage.

The hot-water vaginal douche and *the wool vaginal tamponade* are described in Chapter IV.

Hot Hip-pack.

The hot hip-pack is a most efficient form of hydrotherapy. The application of it is as follows: Let an ordinary sheet be folded lengthwise into several thicknesses, so that its width will reach from the umbilicus to the middle of the thighs. Let this be made into a roller bandage, dipped in very hot water, and wrung as nearly dry as possible, preferably by a clothes-wringer. Pass this bandage several times around the pelvis, so as to envelop the zone from the umbilicus to the middle of the thighs. Cover it with a dry sheet and let the patient lie in it for thirty minutes. It is well, in order to retain the heat as long as possible, to place between the wet and dry sheet a rubber sheet or a rubber bag of hot water. The pack should be repeated daily, or twice daily, according to the tolerance of the patient. An occasional objection to its use is its tendency to cause profuse menstruation. The treatment is a most efficient means of stimulating the pelvic circulation, and thereby of promoting absorption of morbid products. Chronic constipation, pelvic pain, dysmenorrhœa, and other functional disturbances often give way promptly under its influence. As a result of such treatment the disorder may, however, lapse into subacute ovaritis with sometimes constant, sometimes remittent symptoms.

Electricity.

The galvanic electrode, even with light dosage, has repeatedly caused extensive destruction and cicatricial contraction in the genital tract, especially in the upper part of the vagina. The intra-uterine electrode

is painful and often intolerable. The occasional dangerous infection following its use is proverbial. The faradic current is used as a form of deep local massage, and the galvanic for its supposed resolvent effects. Both are said to promote absorption. The electrical treatment of pelvic inflammation, after a long and faithful trial, has, in the author's hands, proved itself neither in safety nor efficiency equal to the promise of its devotees.

Massage.[1]

Pelvic massage for chronic inflammation around the uterus, a treatment developed by Thure Brandt, is one of the most effective of the non-operative local measures. Massage is indicated for: 1, the removal of inflammatory exudates; 2, the breaking up and stretching of adhesions; 3, the restoration of function to contracted or overstretched ligaments; 4, the reposition of displaced organs.

The application of massage unfortunately requires more technical skill than the physician would possess unless he had received long and special preparatory training; the application of it therefore must necessarily remain in the hands of a few experts. The objection commonly and strongly urged against massage, that it may excite sexual reflexes and produce erotic feelings, is, generally speaking, in this country at least, prohibitory; this objection, however, provided that proper methods and precautions are enforced, need not, in selected cases, have great force; that is, properly conducted massage in a suitable case should not provoke erotic feelings. The tendency to erotic excitement would usually be counteracted by the discomfort which the manipulation necessarily entails upon the patient; moreover, a subject of erotic tendencies would clearly be unfit for the treatment. Much depends upon the individuality of the operator, and upon the observance of an inviolable rule that the left hand and vaginal finger be kept perfectly motionless, away from the clitoris and against the posterior wall of the vagina. The massage is done entirely with the right hand over the abdomen. Obviously the treatment so far as practicable should be given by a technically trained woman. The writer has for many years, with gratifying results, entrusted selected cases to a competent, specially trained lay masseuse.

Action of Massage. Massage in the pelvis, as in other regions, quickens the circulation, prevents stasis in the lymph-channels, furthers resorption and retrogressive metamorphosis, gives tone to the muscles, excites muscular activity, and so improves the nutrition.

Indications for Pelvic Massage. The principles, uses, and indications are found in the following conditions:

1. Wide, loose adhesions or cicatricial cords binding down the uterus or its appendages in abnormal positions or locations.

[1] In the description of pelvic massage the author has made free use of quotations and adaptations from the following sources:
Emil Kleen. Handbook of Massage, Hartwell's translation, 1892.
Ziegenspeck. Anleitung zur Massagebehandlung bei Frauenleiden.
Hiram Vineberg. Pelvic Massage in Gynecological Cases. American Journal of Obstetrics, pp. 161-392, 1893.
William H. Rumpf. Ibid., p. 37, 1895.
Jentzer. Gymnastique Gynécologique.
Numerous illustrations designed to explain the manipulations of Brandt, drawn, with some modifications, from the figures of Jentzer and Ziegenspeck, may be found in Chapter XLVII.

2. Chronic residual exudates or infiltrates of inflammatory origin.
3. Cicatricial contractions.
4. Displacement of the uterus due to the above causes or to atony of the muscular and ligamentous supports.

Menorrhagia, metrorrhagia, amenorrhœa, and dysmenorrhœa are symptoms that may come from a wide variety of diseased conditions. Some of these conditions are indications and some are contraindications for massage. It is useful for the relief of pain and for some pelvic neuroses, such as the pain that occurs in the cellulitis of Stapfer.

Contraindications for Pelvic Massage. Numerous disappointing and disastrous results have followed the use of pelvic massage; they have all been consequent, however, upon faulty technique or failure to exclude unsuitable cases. The contraindications are:

1. Acute inflammatory conditions of the uterus and its appendages, especially perimetritis, and Fallopian tubes enlarged from pyosalpinx.
2. Acute parametritis.
3. Malignant disease, tuberculosis, syphilis, gonorrhœa, and pregnancy.

Menstruation is not necessarily a contraindication; in fact, the treatment will often be found at that time most beneficial for the relief of dysmenorrhœa.

It is clear, from what has been said, that the first and most important point to be considered in pelvic massage is the diagnosis. Unless the conditions within the pelvis are accurately known, or, at least, unless it is possible to exclude infection and suppuration of the tubes, the treatment is contraindicated.

Technique of Massage.[1] The patient lies with her hips resting on the end of a low couch, with the thighs and legs flexed and the feet resting on a chair placed about a foot from the end of the couch. The operator sits at the left of the patient, and introduces one or, better, two fingers of the left hand into the vagina, passing his arm under the left knee of the patient. The sole purpose of the fingers in the vagina is to raise or fix the parts to be treated. As already stated, the massage is given entirely with the right hand.

After having introduced the fingers of the left hand, the right hand is placed on the abdomen. It is passed from above under the skirts, which have previously been loosened at the waist. The massage, which consists of circular motions in the direction of the venous circulation of the organ to be manipulated, is now begun; gently, in the surroundings of the diseased part; and when the first tenderness has disappeared is continued more heavily, with short intervals of rest; it is discontinued gently as it was begun, and is finished by a few short vibratory motions of the hand placed flat on the abdomen. This procedure should be repeated for about ten minutes, daily.

An important factor in pelvic massage is the contractility of the uterus. Arendt[2] and other investigators have shown that any uterus,

[1] Adapted, with minor changes, from Rumpf. American Journal of Obstetrics, 1895, vol. xxxi. p. 37.

[2] Arendt. Contractility of the Uterus. Transactions Tenth International Medical Congress, Berlin, 1890.

after being manipulated for some time, will contract. This is illustrated most strikingly in the puerperal uterus, but it is noticed very frequently during the massage of a non-puerperal uterus. It is easier to map out from its surroundings a hard uterus than a soft and flabby uterus. Narcosis in the examination of patients to verify diagnosis may be dispensed with in many cases by the use of massage. The patient is really being examined during the whole time of the treatment.

The rapid circular motion, by removing congestion, helps to relieve tenderness. If the massage is begun around the sensitive part, the patient's attention is diverted from the pain. The hand is gradually pressed more deeply into the pelvis, and at each treatment some thickening or adhesion may be discovered which was not apparent at the previous examination. The pain which makes it difficult accurately to outline the organs at the first examination, may itself be an indication for the massage. It is astonishing how much relaxation may be obtained in a few minutes by the use of gentle massage.

In all cases complicated by chronic constipation the treatment should be concluded by circular movements for a few minutes, along the ascending, transverse, and descending colon. Regulation of the bowels relieves pelvic congestion. In many cases, says Rumpf, "the tampon gets the credit when the cathartic pill deserves it."

Brandt had better success than his disciples, because he laid much stress on general treatment, and especially on Swedish gymnastics, which, carried out properly and scientifically, will always be of material use. If the practitioner is not prepared to direct these exercises, he should place them in the hands of a competent medical gymnast; they form a special branch of study; the acquirement of a proper knowledge of this gymnastic work would require many months of practical training.

In conclusion, it may be emphasized that pelvic massage, though not a panacea, is a rational therapeutic agent, and is applicable for the relief of many conditions that have been a reproach to gynecology, conditions for which there is no other equally good remedy. In many instances it will take the place of unnecessary and formidable surgical operations that without it might be the only and the rather dubious alternatives to unrelieved suffering.

With the following general precautions, massage is a relatively safe remedy. In brief—

1. Be certain of the diagnosis, at least so far as to exclude the contraindications of acute inflammation, suppuration, and malignant disease.

2. Insist that a sufficient time shall have passed between the last active inflammatory process and the beginning of treatment.

3. Begin all massage gently and over a space wider than that directly affected; as the sensitiveness decreases gradually concentrate on the parts to be especially treated.

4. Do not attempt actual tension or stretching of adhesions until the tissues are prepared, by previous massage, to endure it.

3. Do not attempt reposition of organs until relaxation and tolera-tion are sufficiently secured.

4. Avoid at any time the causation of severe pain; discontinue the treatment if pain results. Be watchful for complications and acci-dents, and especially cautious in case of extensive perimetritic lesions.

5. Keep the control of treatment at least under the direction of a competent physician. It is essential that one specially skilled in the diagnosis of possible morbid conditions and complications be alone intrusted with the manipulations. For obvious reasons, it is desirable that the manipulations be made by a woman.

The various methods of non-surgical treatment outlined above may be employed in connection with surgical treatment: for example, vagi-nal section of hydrosalpinx, followed by efficient local massage and such constitutional treatment as would improve the patient's resistance [illegible] may result in cure.

CHAPTER XXIII.

SURGICAL TREATMENT OF SALPINGITIS, OVARITIS, AND PELVIC PERITONITIS.

WHEN the disease has progressed to permanent obstruction of the tube and the formation of pyosalpinx, without periodical discharges of pus through the uterus, and especially when the occasional attack of local peritonitis proves that the infection is not constantly confined to the tubes, the treatment described above is no longer conservative; its continuance may be even more dangerous than the most pronounced operative measure. A time has come when a radical operation, even to the removal of the diseased organs, may be less dangerous than the disease, and, relatively speaking, therefore becomes the conservative procedure. The inflamed tube, enlarged to the size of the finger,[1] will seldom return to its normal state and functions. If, together with this condition, there be evidence of suppuration or great local irritation, the indication for operation is clear.

For the preparatory treatment, see Chapter II.

The operative treatment of acute pelvic inflammation does not differ materially in principle from that of the chronic. It, however, more frequently requires vaginal than abdominal section.

The removal of the Fallopian tube alone is called salpingectomy; that of the ovary alone is called oöphorectomy. When tube and ovary are removed together the operation is designated as oöphorosalpingectomy, or salpingo-oöphorectomy. Usage reserves the word ovariotomy to signify the removal of an ovarian tumor.

Routes of Operation. There are two recognized routes for the operative treatment of inflamed uterine appendages,—the abdominal and the vaginal. An operation by the abdominal route necessitates abdominal section, also called cœliotomy or laparotomy. An operation by the vaginal route involves vaginal section. It is often necessary to combine abdominal and vaginal section in one operation.

OPERATION BY ABDOMINAL SECTION.

The reader is referred to Chapter V., on General Principles of Major Operations, for preparatory medical treatment, for the technique of abdominal section, and for the general conduct of the operation. It is often necessary to add to this operation a vaginal section, hence the importance of making in the vagina and about the vulva the same aseptic preparations as would be made if vaginal section were planned from the beginning.

Sometimes the inflammatory exudate has extended through the

[1] Schauta. Centralblatt für Gynäkologie, 1893.

peritoneum to the subperitoneal structures, and so disorganized and disguised the parts as to render them difficult of recognition. Under these conditions careful dissection is necessary, in opening the abdomen, to avoid the unfortunate accident of opening directly through the thickened, leathery peritoneum into an adherent bladder or intestine.

During an operation the surrounding peritoneum should be protected against possible rupture of tubal or ovarian abscesses by the free use of sponges so placed as to absorb any escaping fluid. These sponges, if contaminated, should not be introduced into the cavity a second time, but should be removed, laid aside, and clean sponges used in their place.

If adherent omentum is in the way, it may be separated gently with the sponge—that is, sponged off from its attachments. If not adherent, it may be pushed aside. Any bleeding points should be secured by fine catgut ligatures, torsion, or temporary forcipressure.

If the case be simple, with no adhesions, or if the adhesions be few and easily broken, the operation will be relatively simple. The index-finger of the left hand finds the fundus and posterior wall of the uterus, and then maps out the diseased areas in that region. The finger, starting from the posterior wall of the uterus, sweeps along the posterior fold of the broad ligament on either side and examines the Fallopian tubes and ovaries. These organs, now accessible to sight and touch, may be subjected to any necessary operation or manipulation. See Trendelenburg Position. The incision, if too short, may be lengthened. The intestines are pushed upward and isolated by flat gauze or sea sponges. If there are no adhesions, the appendages may be lifted gently up into the wound and examined. The surrounding exposed parts should be protected by gauze sponges. If the removal of the appendages is necessary, the operation is performed as follows:

Place a ligature on the infundibulo-pelvic ligament—*i. e.*, on that portion of the broad ligament between the ovary and the wall of the pelvis. Place another ligature on the other end of the broad ligament where it joins the uterus. This ligature should not include the Fallopian tube. These two ligatures largely shut off the ovarian vessels and render the remainder of the operation almost bloodless. Grasp the tube, ovary, and adjacent portion of the broad ligament in the left hand, and with the scissors remove them. As these parts are severed bleeding points may be secured by temporary forcipressure. If any of the tube is left, the result may be impaired by the continuance of physiological and pathological processes after the operation; hence the necessity of carefully dissecting out the cornual portion of the tube. Fine catgut ligatures are now placed upon any bleeding point between the two ligatures already tied, and the cut margins of the broad ligament wound are whipped over and together by a fine, running catgut suture. The uterine wound made by dissecting out the uterine end of the tube is closed by interrupted sutures or by a continuation of the running suture just described. Figure 174.

[1] Proposed by Polk, Clinical Gynecology; Keating and Coe, p. 379; by Penrose, American Journal of Obstetrics, August, 1895; the peculiar glove-stitch shown in Figure 156 was suggested by Watkins, Transactions American Gynecological Society, 1896.

FIGURE 174.

Showing the glover's stitch and the method of introduction.

Author's Operation.[1]

An important modification of the technique described in the above paragraph, which the author has used for two years with the most satisfactory results, is shown in Figures 175 to 178. This method is substantially the same as the one shown in Figure 174, except that instead of whipping over the margins of the broad ligament wound between the two ligatures on the ovarian artery, the ligament is doubled upon itself and stitched together so as to form a line of union at right angles to the one just described. The effect is to shorten and strengthen the broad ligament, and thereby to secure the uterus against descent and backward displacement. If there is great tendency to descent or retro-position, the round ligaments also may be drawn into the broad ligament wound and shortened by including them in the broad ligament sutures. This method is especially applicable to all cases in which there is relaxation of the pelvic floor and consequent descent of the pelvic organs. It obviates the necessity in such cases of such supplementary operations as hysterorrhaphy and vaginal hysteropexy.

Complications in the Removal of the Uterine Appendages.

The difficulties and dangers of the operation may be so great as to make it one of the most formidable in surgery. The special technique to meet the varied conditions of grave pelvic inflammation will turn

[1] Published in the Clinical Review, April, 1902.

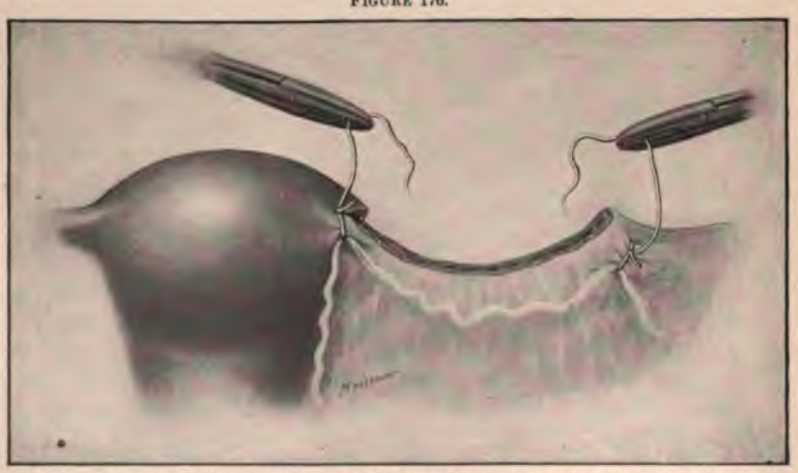
upon the presence or absence, first, of pus or other infectious fluid; and, second, of adhesions.

FIGURE 175.

REMOVAL OF UTERINE APPENDAGES, first step. The tube has been freed from the adhesions and drawn up into the abdominal wound; one catgut ligature passed around the ovarian artery as it runs through the infundibulo-pelvic ligament and another as it enters the uterus. The dotted line under the tube shows where the incision is to be made for the removal of the appendages. The ovary is on the other side of the tube, and therefore not shown.

Technique in Pus Cases. Although the pus in chronic pyosalpinx is usually sterile, it is not always so; hence it is safer to proceed,

FIGURE 176.

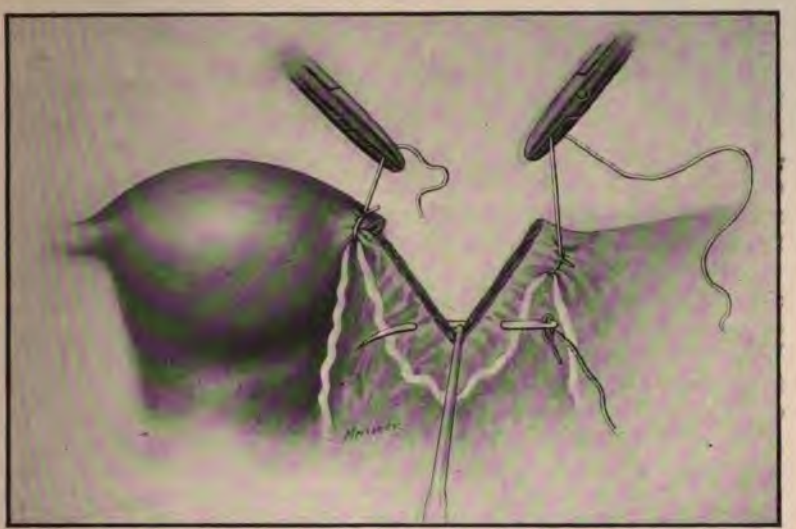


REMOVAL OF UTERINE APPENDAGES, second step. Ligatures on ovarian artery drawn tight and tied, and tube and ovary removed. Any small bleeding points in the cut surface between the two ligatures that secure the ovarian artery would be tied by fine catgut ligatures. Observe that the cut edge of the ligament contracts and shortens upon removal of the tube. Two free ends of the ligatures are cut short; the other two are held in pressure-forceps.

except in matters of drainage, on the supposition that all pus or other fluid is infectious, and, if possible, therefore to enucleate the sac with-

out breaking it. Aspiration of a part of the fluid from a very tense

FIGURE 177.



Removal of uterine appendages, third step. Traction by two hæmostatic forceps on the ends of the broad ligament wound and by a tenaculum on the centre of the wound show how the wound is to be folded upon itself and closed; needle introduced to show where the continuous suture is to be placed for closure of the wound.

tube may decrease the risk of rupture. Contact of the pus of a ruptured tube with the peritoneum may have no serious results, for:

FIGURE 178.

Removal of uterine appendages, final step. Wound in broad ligament folded upon itself and closed by running catgut sutures. Additional fine catgut sutures may be used if necessary to perfect closure. This suture when tied will complete the operation on the ligament.

1. The fluid may be sterile, and therefore innocent.
2. Even though infectious, if thoroughly washed or sponged out,

the residue of septic matter may be taken up by the peritoneum and thrown off by the organs of elimination. The capacity of the peritoneum to take care of such fluids is very great. The conditions, however, under which it does or does not do so are not fully known. See Chapter VII., on Drainage.

The coexistence of pyosalpinx and a communicating parametric abscess clearly renders the clean enucleation of the pus sac impossible. After the removal of such a tube the parametric abscess cavity must in every case be in direct communication with the pelvic cavity. A free opening from the cul-de-sac of Douglas into the vagina and effective gauze drainage by that route are now desirable. If possible, the general abdominal cavity should be shut off by stitching the omentum or peritoneum over the abscess wall. If there be a parametric abscess pure and simple, without tubal or other connections, the pus is much better evacuated and drained through the vagina. This would involve the abandonment of the abdominal route and the substitution of the vaginal. In some cases, even with tubal connections the vaginal route may be preferable.

When the pelvic viscera are matted together with strong and extensive adhesions, including a great quantity of inflammatory exudate and pus, the operation may become long, extensive, and very dangerous. Such conditions usually require a relatively long incision. In addition to the removal of the appendages, vaginal drainage and hysterectomy may be necessary. These cases frequently offer most favorable indications for the vaginal route.

The class of cases described in the foregoing paragraph furnish most of the mortality in oöphoro-salpingectomy. Such formidable conditions may even prohibit the radical operation and require, instead, simple incision and drainage of the pus cavity. Ofttimes the adhesions between the visceral peritoneum covering the diseased organs and the parietal peritoneum through which the incision is made are so extensive that the operator may find his way directly into the pus cavity without exposure of the general peritoneum. In such cases it may be wise not to attempt the removal of the appendages, nor even to make a complete diagnosis, but rather to locate, incise, and drain the pus cavity. A more radical operation may be made later, if necessary.

When the adhesions described above do not permit direct opening of the pus cavity without exposure of the general peritoneum, the surgeon may, after making the exploratory incision, locate the pus sac, and without immediately opening it stitch it to the parietal peritoneum. A few days later, when adhesions have formed, the abscess may be opened without involvement of the general peritoneum. Many surgeons perform both operations at one time, as follows:

1. Open the abdomen and locate the pus sac.
2. Pack sponges all around to protect the peritoneum.
3. Remove the fluid by the aspirator.
4. Wash out the sac by reversing the action of the aspirator, care being taken not to contaminate the surrounding peritoneum.
5. Enlarge the aspirator opening by incision, and unite with interrupted catgut sutures the visceral peritoneum around this incision to

the parietal peritoneum around the abdominal incision—*i. e.*, join the two incisions into one.

6. Curette the sac for the removal of granulations, blood-clots, and other undrainable material.

7. Drain with rubber tube or glass tube or gauze. Constant drainage may be required for months before permanent closure of the wound. So long as the patient's health improves or continues good it is better to wait for the sinus to close. If at any time there be evidences of new pus formation, a radical operation for removal of the tube should be considered.

Upon opening the abdomen one may locate a pus sac adherent to some other part of the abdominal wall. It might then be good surgery to close the first incision and make another directly into the sac. The abscess could then be evacuated without contamination of the peritoneum.

The cases described above are often more efficiently treated by vaginal section and drainage, or by the removal of such organs through the vagina, as the case may require.

The indications and technique of washing and sponging out the peritoneal cavity, and the indications and modes of abdominal drainage and the toilet of the peritoneum, are discussed under the General Principles of Peritoneal Surgery, in Chapters VI. and VII.

Technique in Adhesions. Conservative surgery specially reserves for enucleation only hopelessly diseased organs. Strong and extensive adhesions are among the most common difficulties in the removal of such organs. The first objective point, as in the simple cases, is the fundus and the posterior wall of the uterus. From this point the finger searches out the diseased organs on either side and recognizes their relations to adjacent structures. An ovary or tube, even though imbedded in apparently inseparable adhesions, may often be shelled out with relative ease if the weaker lines of cleavage can be found and made the starting-points of enucleation. Let the tip of the index and middle fingers of the left hand search for sulci between the diseased appendages and the adherent surfaces. Look for points of least resistance, and follow their lead so long as the separation does not require undue force; then look for other such points. The finger advances with gentle firmness, using the side-to-side and to-and-fro motion, until by pressing here and there, and by pinching the adherent structures apart, the outlines of the offending organs are made clearer and clearer. By this means they are finally isolated and brought up into the wound. The technique of removal is then the same as for non-adherent appendages.

Technique in Hemorrhage. During the enucleation it is not well to stop for minor bleeding points. Let the organs be isolated from the bed of adhesions as rapidly as safety will permit. Always keep sponges packed around to control hemorrhage by pressure and absorb blood, pus, or serum. When the appendages are cut off and the ordinary ligatures applied the bleeding will usually have ceased. If not, pack hot sponges firmly against the bleeding surfaces, frequently changing them to prolong the heat. Double ligature of the ovarian

vessels on either side of the stump, as already described, is always a good safeguard and often necessary. A sterilized saturated solution of antipyrine, as recommended by Roswell Park, is a valuable hæmostatic. If bleeding is not controlled by prolonged hot-sponge pressure, antipyrine, and ligature of the ovarian vessels, and the bleeding points cannot be secured by isolated ligatures, it is better not to prolong the operation by temporizing, but to insure hæmostasis by immediate ligature of the uterine arteries. The ligature is applied in the same manner as for abdominal hysterectomy.

Technique in Abdominal Hysterectomy. If in the course of the operation the indication arises for the removal of the uterus, the operator must proceed to it at once. See later paragraphs on the indications for hysterectomy. The danger will now multiply rapidly with delay. The broad ligaments, including the ovarian vessels, are ligated and cut away. The uterus meanwhile should be drawn strongly up into the wound. This serves the double purpose of checking the hemorrhage from the cut ends of the uterine vessels and bringing the lower uterine attachments within the operator's easier reach. A circular incision around the uterus is made just above the level of the vesical attachment to the uterus, and the adjacent circumuterine structures are stripped away from the uterus, the separation being close to the uterus. This stripping is done with the handle of a scalpel or the finger, or both. Bleeding points from the vaginal or rectal anastomoses are secured by catgut ligatures. In the course of this enucleation the uterine arteries are isolated and ligatured separately, or located by the sense of touch and tied *en masse*. To avoid the ureters, the arteries must be tied close to the uterus. The uterus is now cut away and the peritoneal margins of the wound are inverted toward the vagina. If drainage is not required, the vaginal opening is closed on the peritoneal side by fine, continuous or interrupted catgut sutures. See Technique of Hysterectomy for Cancer.

It is sometimes difficult to work one's way from above into the vagina. After stripping off the bladder, further progress may be facilitated by a longitudinal incision through the anterior wall of the cervix and the os externum into the vagina. The incision is described with an illustration in the chapter relating to hysterectomy for myoma. The removal of the uterus is sometimes made easier by introducing a Simon speculum into the vagina and dividing the pericervical structures as in the beginning of vaginal hysterectomy.

Drainage, if used, should be into the vagina. The gauze drain is best introduced through the abdominal wound and carried thence into the vagina. See Vaginal Gauze Drainage in Chapter VII.

Technique in Intestinal Opening. Mention has been made of the breaking through and discharge of the contents of a pus tube into an adherent intestine. The enucleation of such a tube would necessarily leave an opening in the intestine. Some provision must then be made to keep the contents of the bowel from escaping through this opening into the free abdominal cavity. There are several possible plans of procedure.

1. If the opening is small and accessible, it should be closed with

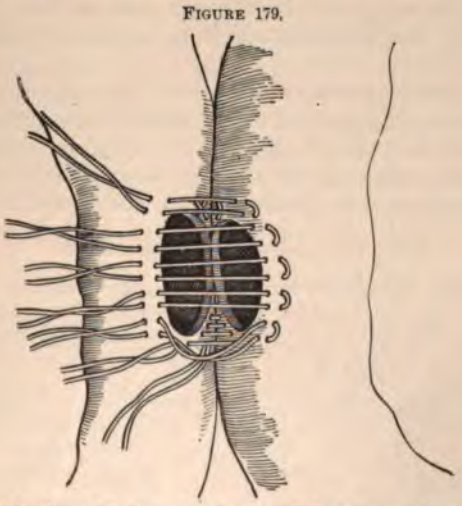
sutures and treated accordiug to the requirements, with or without abdominal drainage.

2. If the opening is accessible and the loss of bowel wall so great that repair with sutures would destroy the permeability of the bowel, the indication is for resection or for stitching the opening into the abdominal wound, and making thereby an artificial anus. Unless contraindicated by the exhausted condition of the patient, resection might be preferable, for if the artificial anus did not close spontaneously resection would subsequently have to be made.

3. If the opening is so deep in the pelvis as to be inaccessible or the patient is too exhausted to permit suture, the territory around the fistula may be quarantined from the general peritoneum by means of gauze packing. Adhesions will form in a few hours around the packing and thereby shut off the leaking bowel from the general peritoneum. The writer has successfully treated two cases by this method. The gauze may be brought out through the abdominal wound; or if the fistula is deep in the pelvis, it is better to pass the gauze drain into the vagina through an opening made for the purpose and close the abdominal wound.

4. If the fistula is too large for suture, the parietal peritoneum may be made to take the place of the lost intestinal wall. This will require the edges of the fistula to be united to the abdominal wall by means of a plate of decalcified bone or other material. The plate should have small perforations one-sixth of an inch apart all around near its outer edge; it is placed inside the intestinal opening, and through this perforation the margin of the bowel may be stitched to

FIGURE 179.



Anastomosis of the intestine at the two points where it had communicated with the sactosalpinx. One row of sutures introduced. Author's case.

the parietal peritoneum. The sutures should transfix the bowel wall and the abdominal wall and be tied on the skin. This would approximate serosa to serosa.

The following case is illustrative and instructive. In an operation at St. Luke's Hospital, Chicago, a large friable pus tube was in communication with the bowel at two points. After enucleation there was a fistula too large to be closed at each of these points. The bowel wall surrounding the fistula was, moreover, extremely thickened and friable. The first impulse was to resect the bowel at each point of injury. Instead of this most formidable operation, however, the following plan was adopted successfully: The two openings were brought together and united by three rows of fine continuous sutures. The fistulæ thereby were utilized as openings for an intestinal anastomosis. The abdominal wound was closed with only a slight gauze drain extending from its upper angle to the immediate neighborhood of the intestinal sutures. This drain was removed on the fourth day. The result was complete recovery. This principle has been employed in the repair of gunshot wounds; but, so far as the writer is informed, it has never been used in a case like the above.

Technique in Accidental Wounds of the Ureter. In the course of a pelvic operation the ureter may accidentally be cut in the longitudinal direction, or partially severed in the transverse direction, or completely divided. Then one of the following operations will be indicated:

Incomplete Division of the Ureter.

Ureterorrhaphy. If a ureter opened in the longitudinal direction is closed by a line of union running in the same direction, there will be danger of stricture at the point of closure. To prevent this, the line of union should run at right angles to the line of incision—that is, transversely, as suggested by Fenger, who deliberately opened a strictured ureter longitudinally and then increased the calibre by closing it transversely.

In case of partial transverse division, Van Hook suggests that a longitudinal incision be made directly across the middle of the transverse cut at right angles to it and twice as long as the diameter of the tube. The sharp angles should then be rounded off with scissors and the wound sutured, as described above for longitudinal wounds.

Complete Division of the Ureter.

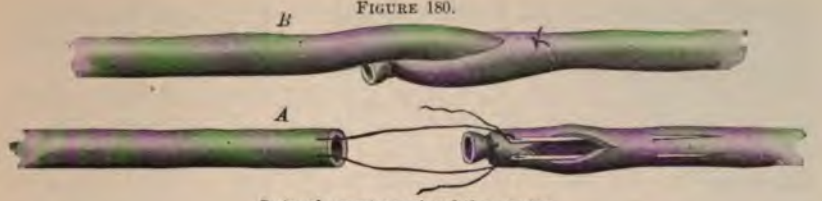
Insertion into the Bladder. If the part above the injury can be drawn down to the bladder without undue traction, it should be inserted into the bladder through an opening made for the purpose and fixed there by means of fine sutures.

Lateral Anastomosis. If the part above the injury will not reach the bladder, it may be inserted into the lower fragment after the method of Van Hook.[1] This operation is shown in Figure 180.

Ureteral Fistula to the External Surface. If for any reason none of the above operations is practical, the ureter should be brought out through the lower end of the abdominal wound at the nearest possible point to the bladder, so that the urine may discharge temporarily to the external surface until connection with the bladder can be attempted, for example, as follows:

[1] Jour. of the Amer. Med. Assoc., June 8, 1893.

FIGURE 180.



Lateral anastomosis of the ureter.

A. First step: natural size. Showing the fragment toward the bladder tied and slit longitudinally for the reception of the upper fragment. The two ends of a fine silk or chromic catgut suture have been passed through the ureteral wall near the end of the upper fragment from within outward. Two fine needles on this suture are transfixing the wall of the lower fragment preparatory to drawing the end of the upper fragment into the longitudinal slit.

B. Second step: natural size. The upper fragment has been drawn into the longitudinal slit in the lower fragment and made fast by tying the suture; in order to insure security against leakage, one more similar suture should be placed and tied on the opposite side, and a few very fine interrupted sutures should be introduced quite superficially around the anastomotic union. The anastomosis thus completed should be covered by stitching omentum or some other peritoneal structure over it. If there is no apparent leakage, the abdominal wound may be closed without drain.

Uretero-cystostomy by Bladder Diverticulum. For cases in which the ureter cannot be made to reach the bladder, Weller Van Hook[1] proposes that the bladder be extended to the ureter by dissecting a flap from the anterior vesical wall and reflecting it upward to meet the ureter in such a manner as to form a tubular diverticulum from the bladder to the ureter.

Nephrectomy. When the ureter cannot be connected with the bladder, the only alternative may be to remove the kidney on the affected side.

OPERATION BY VAGINAL SECTION.

The maxim that every peritoneal section should begin as an exploration holds true as well for vaginal as for abdominal section. Thorough sharp curettage and cleansing of the endometrium are essential preliminaries. The object is, first, to remove the original source of infection, so that in case the uterus and its appendages on one or both sides are not removed the danger of further infection from the endometrium will be reduced to the minimum; second, to prevent infection of the peritoneum from the uterus during the operation. Vaginal section according to the indication is made either anterior or posterior to the uterus, or both anterior and posterior.

Posterior Vaginal Section.

The posterior incision is made close to the uterus, between the cervix uteri and the rectum, from the post-vaginal fornix into the pouch of Douglas. The steps of the operation are as follows:

1. The patient is to be placed in the dorsal position and the vaginal portion of the cervix exposed by Simon's retractors.

2. A semicircular incision, large enough to admit two fingers, is to be made directly behind the uterus in the line of the utero-vaginal attachment; the incision to be made with blunt-pointed scissors curved on the flat, the point being directed toward the uterus and the cervix being drawn down by the vulsellum forceps.

3. The loose cellular tissue back of the cervix between the vagina

[1] Jour. of the Amer. Med. Assoc., June 8, 1893.

and the pouch of Douglas is to be stripped back off from the cervix by the blunt point of the scissors, by the handle of a scalpel, or by the finger, until the peritoneum is reached.

4. The peritoneum is to be divided close to the uterus by a snip of the scissors. The closed scissors points are now to be passed through into the pouch of Douglas and the opening dilated by spreading the blades. The opening is to be still further enlarged if necessary by careful cutting with the scissors or by tearing with the fingers.

5. The index and middle fingers of the left hand are now introduced into the pouch of Douglas, and a digital exploration of the pelvic cavity is made. If sufficient room has not been gained, a perpendicular incision, beginning in the middle of the posterior border of the one already described and running toward the rectum, may be made. In cutting down toward the bowel the left index-finger in the rectum should be used as a guide. This finger is now withdrawn, thoroughly cleaned, and reintroduced into the pouch of Douglas; the right hand is placed over the hypogastrium behind the pubes, and the examination is made precisely as in ordinary bimanual palpation, but with a distinct advantage—*i. e.*, the palpating finger is in direct contact with the uterus and its appendages.

Posterior vaginal section is not well adapted to the removal of the appendages; it is, however, specially applicable to the incision and drainage of pelvic pus-cavities. These cavities may be in the tubes, ovaries, or pelvic connective tissue. See Incision and Drainage of Pelvic Abscesses.

Anterior Vaginal Section.

Peritoneal section anterior to the uterus—*i. e.*, between the uterus and bladder—renders the uterus and its appendages more accessible to conservative radical operation than posterior section, but less accessible than abdominal section. The technique is similar to that of posterior section, and is as follows:

The patient is placed in the dorsal position and the cervix exposed by Simon's retractors. The cervix is seized with vulsellum or bullet forceps and drawn toward the vulva. A transverse semicircular incision close to the uterus, in a line with the utero-vaginal attachment, is made with scissors through the anterior vaginal fornix; or, instead of this, the incision is made in the longitudinal direction in the median line through the anterior vaginal wall from the anterior wall of the cervix toward the bladder. The latter incision is preferable, because, without great care, especially if the cervix is small, the transverse incision is liable to injure the ureters. In making the longitudinal incision, the operator should not only draw the cervix [illegible] well down, but also make strong downward traction on the anterior vaginal wall. This is done with a tooth- or bullet-forceps [illegible] the wall between the cervix uteri and the urethra. If [illegible] the longitudinal incision give insufficient room, it may be supplemented by the transverse. The combined longitudinal and transverse [illegible] the shape of the letter T. They are shown in the Surgical [illegible] Chapter XXVII., also in Figure 180.

The uterus is now drawn strongly forward, and the structures adjacent to its anterior wall are stripped off, keeping close to the uterus, as described above for posterior section. As the bladder is being separated from the uterus it is held up out of the way by an anterior retractor or the finger. When the peritoneum comes into view it will be recognized as a thin, translucent membrane reflected from the uterus. A sound passed into the bladder will prevent cutting that organ for the peritoneum. The peritoneum being exposed, it is snipped with blunt-pointed scissors. The opening thus made into the pelvic cavity is enlarged by introducing the two index-fingers and tearing laterally, and, if necessary, by careful cutting with the scissors. During the separation of the bladder from the uterus a sound in the uterine canal may be useful as a guide.

The corpus uteri may now, if adhesion do not prevent, be seized with vulsellum- or bullet-forceps and drawn forward into extreme anteversion. The fundus may even be drawn into the vagina. If there be adhesions, they may be loosened with the left index-finger introduced over the fundus uteri, the corpus being at the same time drawn more and more into the vaginal opening. The Fallopian tubes and ovaries follow the corpus, and may thus be subjected to examination and any necessary operation. They may be wholly or partially removed as in abdominal section. The closed fimbriated extremity of a tube may be opened or the ovary may be resected. See Conservative Operative Treatment of Adnexal Inflammation in the following paragraphs, pages 292–295.

The removal of the appendages by anterior vaginal section does not materially differ in technique from their removal by abdominal section. Hæmostasis may be secured by the usual ligature of the stump close to the uterus or by running sutures in the broad ligament. See pages 270–276. The appendages should be brought into full view; this may require very firm traction, and the uterus may have to be drawn from side to side. Ligature of the infundibulo-pelvic ligament, which controls the ovarian vessels, is often difficult, sometimes impossible. The most important part of the operation should be under control of the eye. Sometimes the broad ligament, if short, tense, and adherent, cannot be reached through the vagina. It may in such case be safer to abandon the vaginal and resort to the abdominal route. If there is difficulty in returning the uterus, enlarged by congestion, from torsion of the ligaments, the Simon retractor may be used in the manner of a shoe-horn, and the uterus slid in on the smooth blade.

The blood-clots having been sponged out and all bleeding points secured the wound is closed as follows: The peritoneal margins are drawn down and approximated by means of pressure forceps. They are then whipped together with a running, fine catgut suture. The suture is continued as a buried suture to unite the vesical to the uterine surfaces of the wound and finally, as a running suture to close the vaginal margins. The vagina is lightly packed with aseptic gauze.

The anterior incision, except for drainage of pus-cavities, is prefer-

able to the posterior. It involves less danger of post-uterine adhesions, which may result in fixation of the retroverted or retroflexed uterus. Moreover, it offers by anterior vaginal fixation a cure for the retro-malpositions. See Treatment of Retroversion and Retroflexion by Vaginal Fixation, Chapter XLVII. In some cases intrapelvic disease is rendered more accessible by the combined anterior and posterior incisions.

Effects of the Removal of the Uterine Appendages.

The removal of the diseased appendages has been usual in hydrosalpinx and is the rule in pyosalpinx. The operation, if thoroughly performed, is generally followed by atrophy and consequent arrest of function in the uterus. Its result should be to precipitate the menopause. The artificial production of this critical period gives rise to phenomena quite similar to those which characterize the natural menopause, except in most cases menstruation is at once permanently arrested. The popular impression that the operation unsexes the woman in a mental sense or renders her masculine is a mistake. Patients frequently ask whether it will result in the growing of a beard or the development of a bass voice; but no such result has ever been observed. The operation performed on a young girl would doubtless arrest the intrapelvic and some of the extrapelvic developmental processes of puberty, but development once made is permanent.

The effect of the operation upon sexual desire is variable, but probably no more so than that of the natural menopause.

The question of insanity as a result of the operation has been raised; it probably occurs no more frequently than after other operations of equal gravity, probably not oftener than with the natural menopause.

The primary object of the operation is the removal of certain organs which would otherwise be dangerous to life or destructive to health. A most important secondary result is the arrest of physiological function in the remaining uterus. In this connection it is clear that, since pathology is physiology modified by disease, the atrophic changes in the uterus consequent upon the operation may, at the same time that they arrest physiological processes, also put an end to pathological processes. Especially is this true in the inflamed uterus, disease of which is often perpetuated by the constantly recurring menstruation. The frequent disappearance of metritis from the atrophic uterus verifies a recognized principle, that physiological rest may favor the cure of disease. If the uterus is healthy or only the seat of mild catarrhal inflammation, it will usually, upon the removal of the appendages, pass rapidly into the atrophic state, and give no more trouble than would a uterus after the usual menopause. Unfortunately, however, this very common sequence of the removal of the appendages is not constant. The atrophic process does not always follow, or, if it follows, may fail to remove the infection. The infected uterus may be the source of pernicious menstrua-

tion, amounting at times to hemorrhage. A surviving and intractable endometritis often gives rise to profuse uterine discharges. Exhaustive drains upon the patient's strength from such cause may destroy her resistance to disease, reinforce the uterine infection, and perpetuate a group of disabling nervous symptoms.

Should the Uterus be Removed with the Appendages?

This question has been forced upon the surgeon by the numerous immediate and remote failures which have followed the removal of the appendages alone. When the appendages on one side are healthy, or not diseased enough to necessitate their removal, and when on one or both sides enough can be left to give hope that the reproductive function may be preserved, the answer is clearly negative. The essential question is, What shall be done with the uterus when the appendages on both sides have to be removed? It may be urged with considerable force that the failure to bring about atrophy of the uterus and arrest of function, and to secure consequent relief from pernicious symptoms, comes, in many cases, of faulty technique in the operation. Arthur W. Johnstone and Lawson Tait have shown that when the tubes are taken off close to the uterus and every particle of the appendages removed, arrest of menstruation, atrophy of the uterus, and a satisfactory menopause, even in cases of infected uteri, are apt to follow. The explanation of this is simple and as follows: The thorough removal of the tubes cuts off the ovarian artery and the supply from the uterine artery at the point of anastomosis with the ovarian. As pointed out by Johnstone, it also cuts in a similar way the nerve connections of the uterus; hence the observed atrophy and arrest of function. It follows from the above that if the appendages are properly removed hysterectomy is not necessarily indicated. The claim of the enthusiastic hysterectomist, therefore, that when the appendages have been sacrificed the uterus necessarily becomes a pernicious, continuous, disabling, and dangerous source of infection, may, as a universal proposition, be disregarded. In order to bring about the most satisfactory results the tubes should be removed not merely close to the uterus, but the entire tubes, even as they penetrate the cornua, should be removed to the uterine mucosa, and the cornual wounds should be closed by catgut sutures. The fact has already been mentioned that the removal of a tube by the ordinary stump and ligature method often results in leakage of uterine secretions.

When the infection is *acute* the removal of the appendages upon extension of the infection to those organs and to the peritoneum may be wholly inadequate. The propriety of leaving the infected uterus while the causative infection in the endometrium is still overwhelming the pelvic lymphatics with its septic supply may be most questionable; for the uterine infection may continue to spread to the peritoneum even after removal of the appendages. If vaginal incision and drainage are deemed inadequate, the removal of the uterus, together with the appendages, may be necessary for two reasons:

first, to cut off the septic supply; second, to facilitate drainage. When this is done convalescence is more rapid and less complicated than after the mere removal of the appendages; this would be especially true in very virulent puerperal cases.

Objections to Hysterectomy.

1. The fact that the uterus serves as a sort of support for the vaginal vault and is necessary therefore to the integrity of the pelvic floor and vagina.

2. The possibility that removal of the uterus, in addition to removal of the appendages, disturbs the moral and physical well-being of the woman to a greater extent than the removal of the appendages alone. However this may be, many women have the strongest aversion to its removal. So far as may be, without harm, their wishes should be respected.

3. The fact that the removal of the uterus, especially by the hand of a slow or inexpert operator, involves additional shock and danger.

4. The possibility that hysterectomy may cause secondary degenerative changes in the spinal cord or brain. This apparent result has been observed as a sequel of major operations in other parts, especially those involving extensive injury to nerve structures.

5. There are reasons to infer that the uterus, like the ovary, may have an important function as an eliminative organ.

6. The absence of a clear indication.

Indications for Hysterectomy.

1. The matting together of the reproductive organs in one infected mass, with pockets of pus. The difficulty of operation does not, necessarily, neutralize this indication.

2. Tuberculosis of the reproductive organs.

3. Complicating malignant disease.

4. Complicating uterine myoma which cannot be removed without removing the uterus.

5. Involvement of the endometrium in destructive inflammation, when the uterine wall, itself strongly infected, becomes virtually the walls of a pus cavity; under these conditions the uterus is at once a [illegible] source of danger to health and life, and, if removable, should under no circumstances be left.

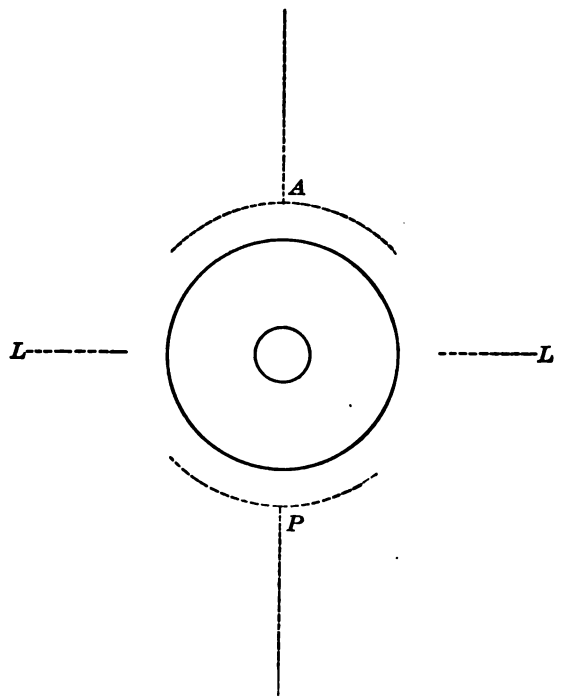
The value of the uterus as a support and a completion for the [illegible] has led some operators to remove the corpus and leave the vaginal portion of it. This can be done only when the operation is performed by the abdominal route, a [illegible] originally but one wound, and that through the abdomen. To leave the cervix, therefore, after removal of the [illegible] of the abdominal operation. If hysterectomy [illegible] the infectious character of the uterus, is to be [illegible] should at least include that part which is usually most infected and therefore most pernicious—the cervix. The

idea of leaving it would never occur in connection with the vaginal operation.

Technique of Vaginal Hysterectomy.

All preparations, including curettage of the endometrium, are made as for vaginal section. The patient is placed in the dorso-sacral position, the legs protected, as directed in Chapter II., with long, sterilized woollen stockings. The vagina, having been thoroughly disinfected, is held open by Simon's retractors, and the uterus seized and drawn down as in ordinary vaginal section. The cervix is then incised all round by a circular cut in a line with the utero-vaginal attachment. The uterus is then detached from the bladder anteriorly and the rectum posteriorly, precisely as in anterior and posterior vaginal section.

FIGURE 181.



Lines of anterior, posterior, and lateral incisions in vaginal section. *A.* Anterior incision. *P.* Posterior incision. *L, L.* Lateral incisions.

In order to gain greater space for operating two lateral incisions, each about one-half inch long, may be made in the vaginal wall. These incisions extend from the lateral margins of the vaginal wound and resemble similar incisions already described in anterior and posterior sections. If still greater space is needed, the perineum may be divided longitudinally, but should be reunited at the close of the operation.

If the uterus is in its normal position the corpus may be drawn

through the anterior opening: if retroverted or retroflexed, it may be everted through the posterior opening. This is accomplished by tenacula or vulsellum-forceps. Seize the corpus as high as possible, draw it down as far as it will come, then grasp it higher up and make more traction, and so on until the eversion is complete. During the operation lateral, posterior, and anterior retractors are frequently required.

If the uterus is large, it may be removed in parts. The operator cuts off piece after piece with scissors. This gives more working room. The method is known as morcellation. The anterior or posterior lip of the entire cervix may first be removed. Then the corpus may be split in the median line and each half separately removed, or the entire uterus may be divided in the longitudinal axis and each half removed by itself. Before cutting the uterus away from the broad ligaments they should be previously clamped by means of strong pressure-forceps or ligatured, as described in the operation of hysterectomy for cancer. If the broad ligament is very large and short, it may be necessary to tie it in parts. If the corpus cannot be drawn into the vagina, the ligaments and their vessels may be clamped or ligatured and cut progressively until they have been entirely severed; the uterus is then removed without eversion. In some cases a single clamp grasped by the finger may be made to compress an entire broad ligament. Eversion of the uterus and consequent torsion of the broad ligaments [illegible] to slipping off of the clamps or ligatures. Fatal hemorrhage [illegible] attributed to this cause.[1] See Chapter XXVIII.

The [illegible] much increased when the uterus and its appendages [illegible] by adhesions. The uterus being drawn down and [illegible] forceps in the right hand, the adhesions [illegible] precisely as in the operation already [illegible] of the appendages. The adherent appendages [illegible] the operation proceeds as if there had been [illegible] technique of closure of the wound is laid [illegible] of hysterectomy for cancer.

[illegible] of cases discussed above offers a large field [illegible] preferable to tubular drainage. The technique [illegible] removal is described in Chapter VII. The [illegible] measure serve the purpose of drainage. They [illegible] removed at the end of forty-eight to seventy-two

Hysterectomy without Removal of the Appendages.

When [illegible] are firmly matted and bound together, and [illegible] from the surrounding structures, and their removal forbidden by the desperate risk of the operation, [illegible] removed and the pus sacs freely opened and left [illegible] vagina. Even if some pus pockets are overlooked, [illegible] break sooner or later into the wound. Such pus [illegible] ovarian, or parametric, when drained in this [illegible] become obliterated; if tubal or ovarian, they generally

[illegible] Annals of Gynecology, January, 1896.

undergo atrophy. Although this partial operation is only permissible for the reasons given above, yet it has been followed by entirely satisfactory results. The explanation in the following paragraph is submitted.

The removal of the appendages and consequent cutting off of the vascular and nervous connection of the uterus are usually followed by atrophy, cessation of function, and subsidence of disease in that organ; conversely, similar results in the Fallopian tubes and ovaries should naturally follow the cutting off of their vascular and nerve connections by the removal of the uterus. In one recorded case of hysterectomy the remaining tubes, however, became healthy and did not atrophy. On the contrary they were, during several years after the operation, the medium of menstruation. The menstrual fluid passed from them into the vagina.[1] This case speaks against the idea that the tubes do not participate in menstruation. In another case[2] pregnancy occurred in the isthmic portion of the tube; there was consequent hemorrhage into the vagina; the tubal opening was dilated and the product of conception curetted away.

Aspiration of Hydrosalpinx through the Vagina.

The contents of sactosalpinx serosa—hydrosalpinx—may be removed by aspiration, and if the aspiration be followed by efficient local massage of the tube the cure may be permanent. As explained in Chapter XXI., occlusion of the ends of the distended tube may have occurred mechanically from swelling of the mucosa or organically from adhesive inflammation. Spontaneous reopening of the tube and restoration of its functions are probable under the former, improbable under the latter conditions.

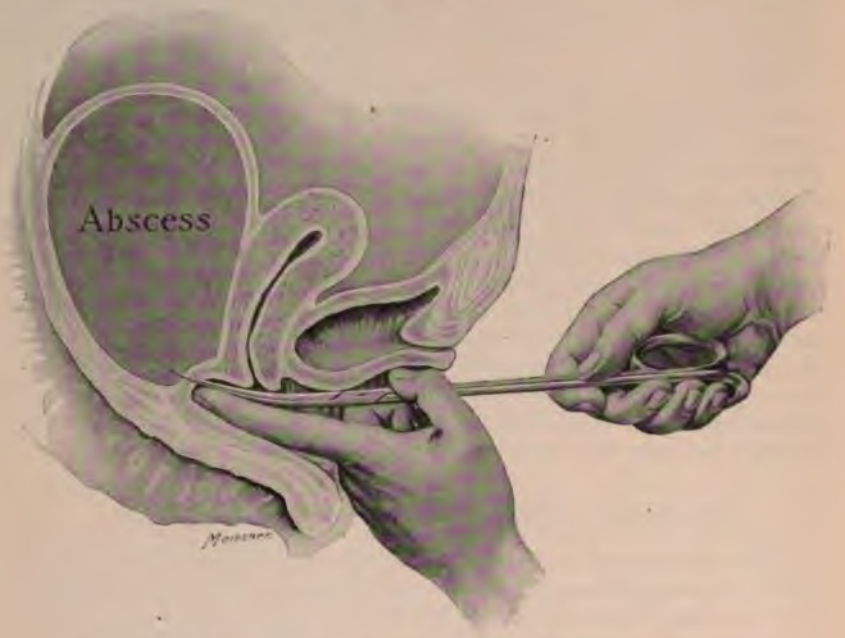
Technique of Aspiration. The diagnosis of sactosalpinx serosa—hydrosalpinx—having been made, the aspiration of it will include the following steps:

1. Make the vulva and vagina aseptic.
2. Locate the sac accurately by conjoined examination.
3. Keeping the right hand behind the pubes over the sac, and using the left index and middle fingers in the vagina as a guide to the point where the sac bulges most toward the vaginal fornix, push the aspirator needle into the sac with the left hand.
4. If fluid does not follow, withdraw the needle slightly and push it in again.
5. Having withdrawn the fluid, the action of the aspirator may be reversed and the sac refilled and again emptied two or three times with a 0.2 per cent. solution of formalin.
6. The aspiration and washing out of the sac having been completed, place a pledget of wool or gauze saturated with a 10 per cent. solution of ichthyol and glycerin against the cervix uteri.

The fluid having been removed, it should be subjected to a bacteriological examination.

[1] Weller Van Hook. Unpublished case.
[2] Wendener. Centralblatt für Gynäkologie, 1896, No. 4, p. 111.

FIGURE 182.



Incision of a pelvic abscess with sharp-pointed scissors through the vagina.

Vaginal Incision and Drainage of Sactosalpinx.

Incision and drainage of sactosalpinx is a recognized procedure.[3] Landau rather warmly recommends it even in pyosalpinx. Its value, however, is more positive in hydrosalpinx. The procedure, even when successful, seldom restores the function of the tube, but produces, instead, complete obliteration of the lumen, thereby converting it into a cord. The same process sometimes occurs spontaneously as a result of recurring appendicitis or recurring salpingitis. The disease is then known as appendicitis obliterans or salpingitis obliterans. Incision and drainage may bring about or hasten this result. The indication for incision and drainage for parametric abscess is much clearer than for sactosalpinx. See Chapter XX.

Incision and Drainage for Chronic Sactosalpinx when the distended tube can be isolated by palpation is performed as follows: First the vagina and vulva are to be thoroughly disinfected, the patient being in the lithotomy position; the sactosalpinx, by steady pressure of the assistant's hand, is now fixed downward toward the vagina, and a trocar properly curved or straight, guided by the left index-finger, is introduced into the sac. On this trocar as a guide, with sharp-pointed scissors enlarge the opening so as to admit the

[3] Landau. Archiv für Gynäkologie, No. 40, p. 85. August Martin. Die Krankheiten der Eileiter, p. 208.

finger. The scissors are made to enlarge the opening by working their point through the wall with alternate spreading and closing of the blades. The sac is washed out with a hot 1 to 3000 bichloride of mercury solution and drained with gauze saturated with a 1 per cent. solution of formalin. The gauze is removed and replaced in forty-eight hours by ordinary antiseptic gauze. The formalin is not repeated except at rather long intervals, and, if healing progresses rapidly, not at all. The sac, if it does not contract promptly, may be cauterized with a saturated solution of iodine in carbolic acid.

The operation should always and imperatively include the thorough removal of the causal infection in the uterus by aseptic sharp curettage. Failure to do this will often lead to disastrous results. In hydrosalpinx, aspiration and massage, as outlined above, may bring about restoration of the tubal function, and should therefore be tried before incision and drainage. The method has been nearly obsolete for twenty years. Its results before the days of Battey, Tait, and Hegar showed relatively few immediate cures and a discouraging number of failures to arrest the pernicious or fatal march of tubal and ovarian suppuration. On the other hand, the more radical extirpation of the diseased organs has saved innumerable women from lifelong invalidism or death. The re-establishment of incision and drainage as a recognized and useful procedure has, however, been made possible by the addition of sharp uterine curettage and asepsis.

There will always be great difficulty in drawing the line between those cases which may be relieved by incision and drainage and those which demand extirpation. The former treatment will be applicable to the more recent and acute cases. The older chronic suppurative cases in which permanent changes have taken place will often require extirpation of the diseased organs. In spite of the recommendation of Landau and numerous successful cases reported by Vulliet, Goulliad, Abbott, and others, it is not strongly indicated in chronic pyosalpinx. The success of the operation requires the removal of the old and prevention of new infection; and the fulfilment of these indications in the many possible cavities and recesses of a pus tube, and in the neighboring pus-pockets whose walls are deeply infected, is often beyond the power of simple drainage and disinfection.

Tubercular Suppuration in the uterine appendages offers the greatest resistance to all conservative measures, and is therefore generally admitted to be a clear indication for the removal of the uterus and its appendages. The great frequency of chronic tubercular infection materially cuts down the number of cases suitable for drainage. It is, moreover, usually difficult to recognize and exclude the tubercular cases until the pus has been removed and examined. The suggestion to defer the radical operation until conservative measures have been tried and failed, is weakened by the fact that after incision and drainage the removal of the diseased organs is always more difficult, tedious, and dangerous.

The foregoing paragraphs relate more especially to incision and drainage for chronic sactosalpinx.

FIGURE 182.

Uterus and appendages removed complete.

Drainage for Acute Pelvic Suppuration. The products of inflammation may be matted and fused in a conglomerate mass. The individual organs may be indistinguishable. The patient's general state from septic poisoning may be so grave as to render a more radical operation extremely hazardous. In these conditions, whether the suppuration be tubal, ovarian, or all combined, vaginal incision and drainage are the curative indications. The advantages are:

preservation and possible restoration to function of the

preliminary sharp curettage the incision is precisely as already described, for posterior. If the post-uterine circular incision gives too through intrapelvic exploration and manipulation, an incision may be made from the centre of the This incision runs in the median line wall from the cervix toward the rectum. this incision the index-finger of the left hand as a guide to prevent wounding the bowel. cleansing, being now returned to the pouch hand being over the abdomen, the examinabimanual palpation. The left index- and to either side until the bimanual sen- free peritoneum posteriorly is almost reached. right or left, and with it the superimposed will usually be found and penetrated without

will be evident to the touch of the exam- cases an abscess-cavity will usually be found.

Conservative Surgical Treatment of Para- and Peri-uterine Septic Gynecological Society, 1885. Adaptation.

During these manipulations the peritoneal cavity may be accidentally opened. This does not specially add to the danger. It is well, however, to retain the finger in the opening leading to the abscess until any escaping pus may be washed out of the vagina, and the peritoneal cavity protected by gauze packing against the inflowing of pus. The finger may then be withdrawn and the pus-cavity evacuated; slight pressing upon the abdominal wall will help to empty the cavity. The packing is now replaced by fresh gauze and the finger reintroduced into the pus-cavity. This is for the purpose of finding and in like manner emptying any neighboring abscess; failure to do this may be disastrous. The other side of the pelvis is now explored, and, if necessary, treated in the same way. All hard inflammatory masses, whether pus-containing or not, are to be penetrated by the finger. No instrument save the finger is to be used after the incision through the vaginal wall has been made. All inflammatory foci having been penetrated, their exposed cavities are now to be packed with a single strip of sterilized gauze, about three inches wide, saturated with a solution of formalin 1 to 200. The outer end of the gauze strip should be carefully retained in the vagina to facilitate removal. Considerable gauze should be retained in the vaginal wound in order to keep it open and insure drainage. The operation is completed by the application of a light vaginal gauze tampon.

The inflammatory deposit will be found in some cases in the median line just posterior to the uterus. Whether intra-peritoneal or extra-peritoneal, it must be thoroughly penetrated and drained until it is evident by bimanual touch that the finger has reached its outermost limits. The finger should be worked from side to side until the surgical sense indicates that the drainage will be sufficient. In some cases the finger cannot go far back in the median line without opening into the peritoneal cavity, but turning to one side or the other the layers of the broad ligament may be separated and, without invading the peritoneum at all, the finger may be pushed into large lateral masses.

As already stated, the pelvic organs and products of inflammation are often so matted and fused together in a conglomerate mass that the operator may be unable to recognize individual organs. He is only guided to septic inflammatory masses by the touch. Parametric abscess and circumscribed intra-peritoneal accumulations of pus offer better chances of permanent cure than pus tubes.

Vaginal incision and drainage are sometimes indicated as temporizing measures in extensive chronic pelvic suppuration, and even in a tuberculous case, if the patient's strength is inadequate to the more radical operation, incision and drainage are indicated. Even though radical cure does not follow, there is usually prompt and pronounced improvement, often sufficient to permit the subsequent removal of the uterus and diseased organs by vaginal section; these cases offer the strongest indication for vaginal as against abdominal section. They are often practically inoperable by the former, though with relative safety manageable by the latter.

If the abdomen has been opened and the case appears to be more

suited for the vaginal route, one may introduce the sutures for closure of the abdominal wound, and before tying them proceed according to the indication to the vaginal operation. This gives the additional advantage of the abdominal opening for guidance in the vaginal work.

Salpingo-Stomotomie.[1]

This operation in selected cases is designed to save and restore the appendages to their normal function instead of removing them. August Martin reports sixty-five cases with two deaths, neither of which was of itself attributable to the operation. In 1885 he began to open the closed abdominal ends of tubes and to study microscopically their contents and the condition of their walls. His method is as follows:

FIGURE 184.

Salpingo-stomatomie. Resection of the tube. Conservative operation for hydrosalpinx. The distended ampulla to the right closed by adhesive inflammation. The ampulla of tube to the left has been removed and the mucosa is being united to the serosa by a continuous suture; the longitudinal slit has been closed by a continuous suture.

1. Bring the tube as far as possible up into the abdominal wound.

2. Protect the adjacent pelvic organs by placing under the tube a flat sponge.

3. Open the end of the ampulla with scissors. The point of closure may be recognized by a scar in which the fimbriæ are still visible.

4. Strip the tube of fluid by pressure applied from the uterine toward the abdominal end.

5. If the contents be serous, odorless, and all fluid, and the mucosa shows only slight swelling and reddening, and the folds are only flattened by pressure, slit the tube up for a distance of about one inch.

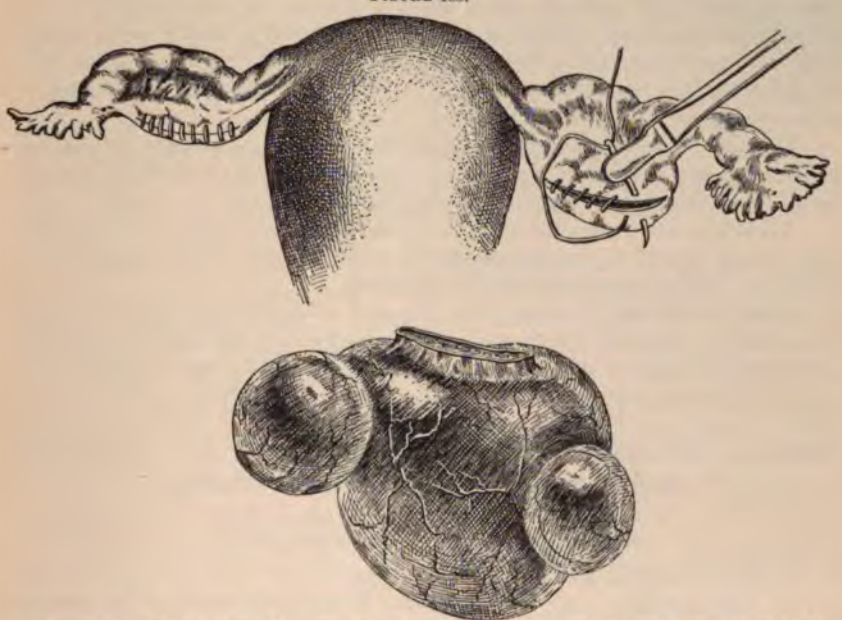
6. If the condition in the upper part of the tube still appears to be only catarrhal, close the longitudinal wound with three fine catgut sutures. Any large superfluous tags are to be cut off.

7. The borders of tubal mucosa at the end of the tube and the peritoneum are to be united by fine catgut sutures so that the opening shall gape and the mucosa shall stay everted.

[1] A. Martin. Die Krankheiten der Eileiter, p. 213.

Hemorrhage is slight and easily controlled by fine ligatures. The everting sutures at the end of the ampulla hold the new ostium close to the ovary. The now reopened tube, together with the ovary, is replaced in the abdomen. Any ovarian adhesions are to be broken up. According to Martin, this operation offers no greater danger

FIGURE 185.



Resection of the ovary. Conservative operations on ovaries. Partial removal of right ovary by resection. Nearly all of left ovary preserved. Small detached multiple cyst below left ovary has been removed from it. The ovaries show whip-stitches for closure of resection wounds.

than any other cœliotomy complicated by peritonitis. Pregnancy followed in two cases in which this operation had been performed on one side and the appendages had been extirpated on the other.

The general conclusion is that extirpation for atresia of tubes whose contents are not infectious may be unjustifiable. The operation, however, can result in restoration of function only when the uterine end is open, or when, if closed, the closure is due to swelling and not to inflammatory adhesion.

Resection of the Ovary.

The diseased portion of a partially diseased ovary may be removed by resection, and the remaining healthy part saved. The indications for resection are these:

1. The saving of a portion of the ovary in order to preserve its reproductive functions.

2. The saving of a portion of the ovary in order to preserve menstruation and other functions of probable importance not definitely known, among them possible elimination and secretion.

Reproduction has repeatedly followed the operation when the uterus, the tube, and only a very small fragment of the ovary were left. The duty of the surgeon to leave for this purpose, when practicable, any functionating part of an ovary, is therefore clear.[1] The preservation of menstruation and other possible functions is urged by many competent observers. As a rule, women are better mentally and physically if menstruation and ovulation are maintained up to the period of nature's menopause. The possible secretory and eliminative functions of the ovary justify the operator in leaving it, or any healthy portion of it, even though the diseased tubes and uterus have to be removed.[2]

The Operation of Resection simply involves the excision by scalpel or scissors of the diseased portion and closure of the wound by means of fine interrupted or continuous catgut sutures.

All conservative operations for opening closed tubes and resection of ovaries should be supplemented by the release of the appendages from any adhesion which may be present.

Ovarian Extract or Dessicated Ovaries, which may be found in the drug shops prepared for internal administration, are much in vogue, and are said to give relief for the disagreeable symptoms of the menopause, whether induced by oöphorectomy or by nature.

Relative Advantages and Disadvantages of the Abdominal and Vaginal Routes in Pelvic Surgery.

Advantages of the Abdominal Route:

1. A larger field is open for operation.
2. The operator may see what he is doing instead of depending largely on touch.
3. Diagnosis of unsuspected conditions and complications is much easier.
4. The abdominal section is adapted to large tumors and pus-sacs, and to conditions high in the pelvis.
5. The appendages may be removed with better chance of avoiding rupture of a pus-sac.
6. There is less danger of wounding intestines, bladder, or ureters and greater facility in the control of hemorrhage.
7. The frequent concurrence of appendicitis and other abdominal lesions with pelvic disease and the impossibility of reaching them by the vagina.
8. It gives more light and more space for conservative work.

Advantages of the Vaginal Route:

1. It gives better drainage, and is therefore specially adapted to cases of vesical or intestinal fistulæ.
2. It avoids abdominal scar and risk of ventral hernia.
3. It is suitable for cases of small tumors without high adhesions.

[1] Polk. Operations of the Uterine Appendages, with a View to Preserving the Functions of Ovulation and Menstruation. Transactions of the American Gynecological Society, 1893.
[2] G. E. Curatulo. Secrezione Interna delle Ovaie, 1896.

4. When properly performed, it lessens the danger from shock, and is therefore suited to cases of extreme pelvic infiltration and adhesions for which the abdominal route is extra hazardous.

5. It involves less handling of the intestines, and therefore less consequent danger of intestinal adhesions.

6. Recovery is less complicated and more rapid.

Unfortunately, the vaginal route is, for at least a very large proportion of cases, impracticable. The long, narrow virgin vagina or the vagina which has become contracted from senile atrophy may render the field of operation almost inaccessible. A very large uterus with exceptionally short, thick broad ligaments and greatly enlarged appendages, with adhesions extending beyond the reach of the finger, may also be difficult or impossible to manipulate through the vagina. Under such conditions the abdominal route is much safer.

In many cases it is well to begin the operation in the vagina and continue by that route as far as the greatest safety will permit, and then, if necessary, open the abdomen and complete the operation by the combined vaginal and abdominal method. Conversely, the abdominal section may have to be supplemented by the vaginal. The combined operation may be the deliberate purpose from the beginning, or the necessity for it may become apparent only in the course of the operation.

In an uncertain proportion of cases the advantages of the two routes are so evenly balanced that either is permissible; the election must then rest with the individual bias of the surgeon. The choice of procedures has in a measure been forecast in the description of special operations already described.

It will be seen from the above that each method has its special advantages and disadvantages. Some of these last are less real than they seem; for example, an objection to vaginal hysterectomy is that it affords only a limited field of operation and small chance for visual control of the work. This objection does not necessarily appeal to the skilled operator. The danger of hemorrhage is avoidable if due precautions are used. Injuries to the bladder, ureters, and intestines may occur with either method, but in vaginal hysterectomy the perfect drainage makes them less dangerous if they do occur.

The operator should not permit his prejudice in favor of either route to lead him to pursue it to the extreme, for that part of an operation which is easy by the vagina is often most difficult by the abdomen, and *vice versâ*.

The vaginal route was for a time much in vogue, but at present among conservative surgeons the tendency is to return to the abdominal route.

CHAPTER XXIV.

URETHRITIS—PROLAPSE OF THE URETHRA—SUB-URETHRAL ABSCESS—CYSTITIS—PYELITIS.

URETHRITIS.

Etiology.

THE predisposing and exciting causes are the same as for inflammation in general; they are:

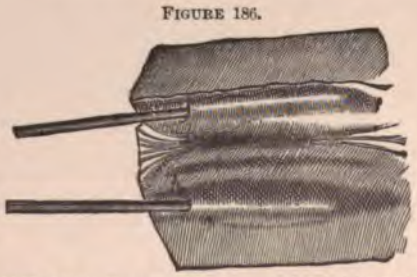
1. Most frequently gonorrhœa; least frequently syphilis, tuberculosis, erysipelas, and diphtheria.
2. Unclean instrumentation and unclean manipulation, such as of the catheter, sound, and hand.
3. Passage of calculi.
4. Irritation from new growths.
5. Masturbation.
6. Improperly fitting pessary.

Pathology and Diagnosis.

The less virulent and milder infections are, according to Kelly, most marked in the anterior and posterior walls of the urethra. The mucosa as exposed by the cystoscope—Chapter III.—is swollen and red from distention of the vessels, and, upon instrumental examination, may bleed. The urethral inflamed glands stand out prominently as oval, yellow spots, and in the anterior part of the urethra sometimes give forth a secretion which looks like pus, but may be only epithelial débris. The tenderness in the milder infections is less marked than in the gonorrhœal variety.

Gonorrhœal infection in the acute form is intense and somewhat characteristic. The swollen mucosa, at first of deep-red color and finally covered with pus, protrudes through the meatus, and has much the appearance of an inflamed, prolapsed anus. It is exces-

FIGURE 186.



Urethra laid open, Skene's glands distended by probes.[1]

sively sensitive to touch, and, especially when touched by an instrument, is apt to bleed. Burning and pain on urination may be intense.

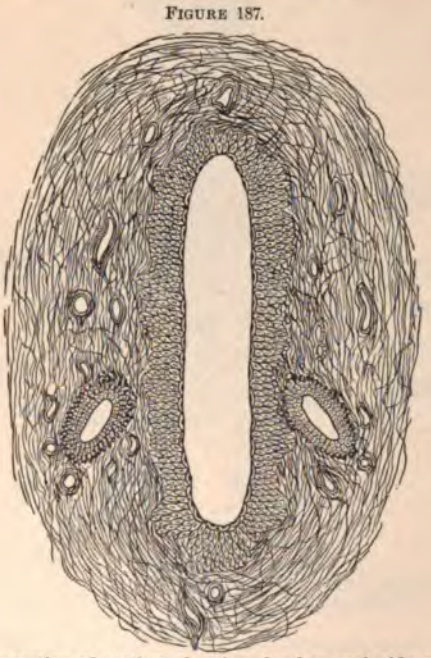
[1] Skene's Diseases of Women.

Microscopic examination of the pus will show the gonococcus. The inversion usually disappears as the urethritis subsides.

Skene's Glands. The urethral glands of Skene are, in this connection, of great pathological significance. They consist of two glandular tubules situated one on either side of the urethro-vaginal wall. Each tubule extends, from a point just within the meatus urinarius, parallel to the urethra to a distance of about five-eighths of an inch. The tubules branch into the muscularis of the urethro-vaginal wall. They are lined with columnar epithelium. When the urethra is swollen and the meatus everted, the openings of the tubules appear just outside the urethra. The normally placed openings are seen on either side by separating the lateral labia of the meatus urinarius.

When inflamed these tubules give forth upon pressure a white serous or purulent discharge. The mucous membrane around their openings, as in follicular pharyngitis, is swollen, thickened, and of a bright yellowish-gray color, or the orifices may be surrounded by a granular areola.[1] The infection involves also the peri-glandular structures. The urethro-vaginal wall in the neighborhood of the tubules is usually swollen and everted. The inflammation is generally purulent, very often gonorrhœal, and may give rise to a free discharge. Occlusion of the tubules by adhesive inflammation and the

FIGURE 187.



Transverse section of urethra, showing gland on each side, magnified.[2]

consequent formation of retention-cysts is possible. There is often great tenderness on pressure. Chronic infection, as a rule, gives rise

[1] Skene's Diseases of Women.

[2] Ibid.

to little or no pain on urination. Inflammation in these glands, until described by Skene, had been mistaken for caruncle of the urethra. The bright-red areola upon the swollen and thickened mucous membrane about the openings of the tubules closely resembles caruncle.

DIFFERENTIATION BETWEEN INFLAMMATION OF SKENE'S GLANDS AND CARUNCLE OF THE URETHRA.

Inflammation of Skene's Glands.	*Caruncle of the Urethra.*
1. Urination not usually painful.	1. Urination painful.
2. Two protuberances correspond to site of openings of tubules.	2. Usually only one protuberance situated anywhere in circumference of meatus or within meatus, but usually on posterior wall.
3. Removal of protuberances does not cure.	3. Removal cures.
4. Mouths of tubules inflamed.	4. Mouths of tubules normal.

As pointed out by Howard, the gonococcus may become intrenched in these glands, as in the glands of Bartholin, and from time to time furnish the infection for recurrent gonorrhœa. Even though the disease may have disappeared from the external surface, reinfection from the glands may repeatedly occur. This source of reinfection, unless carefully sought, is liable to be overlooked. If the urethral glands are in a state of suppuration, the pus may be stripped out of

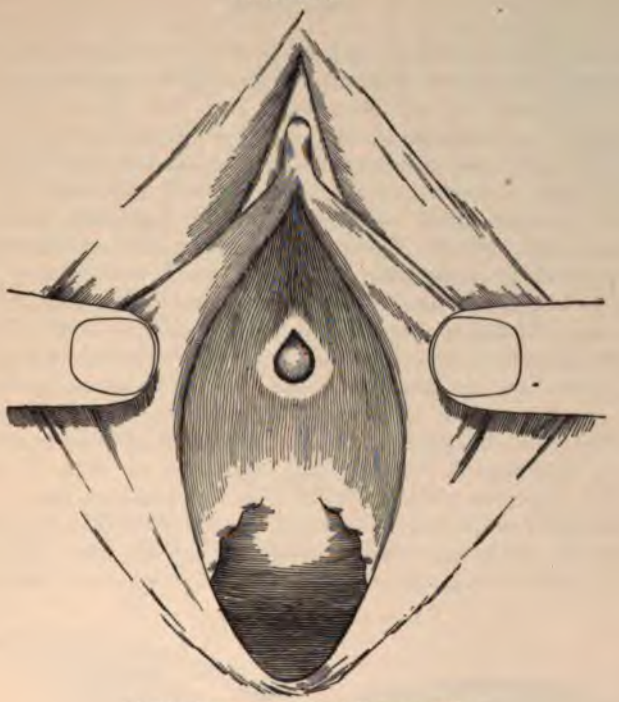
FIGURE 188.

Semi-diagrammatic.

a stroking motion against the urethro-

Figure 190 represents a drop of

FIGURE 189.



Urethral caruncle. Semi-diagrammatic.

FIGURE 190.

Expression of pus from the ducts of Skene's glands.[1]

pus issuing from the duct on digital pressure. A purulent discharge from the urethra is very strong clinical evidence of gonorrhœal infection. Tubercular infection of the glands has been repeatedly observed.

[1] Howard Kelly. Diseases of the Female Bladder and Urethra. Twentieth Century Practice.

Treatment.

The milder non-gonorrhœal form, if not complicated by cystitis, may usually be cured promptly by a few applications made at intervals of four or five days of 3 per cent. solutions of nitrate of silver. The application is made by an applicator wound with cotton, through a urethral speculum. Extreme forcible dilatation of the urethra has been much practised for the relief of this and the more intense forms of urethritis, and has often given prompt and pronounced relief. Permanent injury to the urethra and consequent permanent incurable incontinence of urine have, however, resulted about three times in a hundred of such dilatations. Extreme dilatation is therefore prohibited. Emmet's so-called button-hole operation, described under stricture of the urethra, answers the therapeutic indication of dilatation, and does not impair the retentive power; it also has the advantage of rendering the diseased mucosa accessible to direct local treatment. The opening may at any time be closed by interrupted sutures; but inasmuch as there is usually no functional impairment the closure is seldom called for.

Gonorrhœal urethritis, if acute, is treated first by a single application of a 10 per cent. solution of silver nitrate, then by rest; compresses to the vulva, saturated with lead water and laudanum, or

FIGURE 191.

Emmet's button-hole operation.[1]

sedative suppositories in the rectum, may give relief. If the irritation is very great, the compress may be saturated with a 5 per cent. solution of the muriate of cocaine. The medical treatment will be the same as for gonorrhœa in the male. Eurotropin is highly recommended.

Chronic inflammation in Skene's glands, especially if gonorrhœal, usually resists all conservative measures. If it does not yield to the application of nitrate of silver fused on a fine probe, the entire length of the tubules should be laid open on the vaginal side, using a probe as a guide. The glandular structures are then to be destroyed by

[1] Emmet. American System of Gynecology.

caustic or by excision with scissors, and the surfaces made to heal by granulation. To fuse the nitrate of silver on the probe, let the salt be melted in a small receptacle over a spirit-lamp, and dip the end of the probe into it repeatedly so as to coat it over a thin layer of the salt.

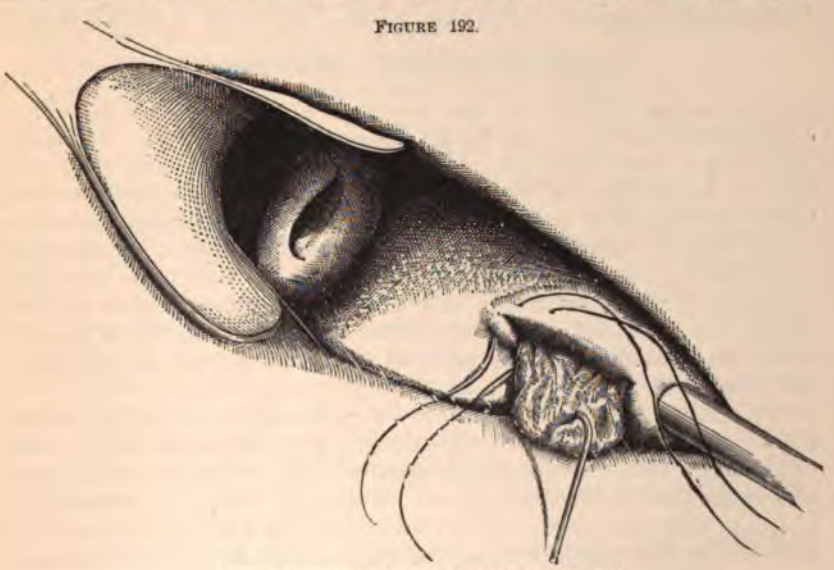
Treatment of Urethral Stricture. The inflammatory process may have been so intense as to produce contracting cicatricial tissue and consequent stricture. The cause of this uncommon lesion is usually gonorrhœa or trauma. The treatment is dilatation by means of graduated sounds, as in stricture of the male urethra. Should dilatation fail, a urethro-vaginal fistula may be made and the vaginal margins sutured to the urethral margins of the opening. When the edges have securely healed the fistula may be closed by denudation on the vaginal surface, the interrupted silkworm-gut sutures being so placed as to give ample calibre to the restored urethra. See Figure 165.

PROLAPSE OF THE URETHRA.

Description.

Prolapse of the urethral mucosa and submucosa, with urethritis, is a condition described by Emmet. The prolapsed mucosa pro-

FIGURE 192.



Emmet's operation for prolapse of the urethra.[1]

jects from the upper or lower margin of the meatus or surrounds the entire outlet of the urethra. The urethra is obstructed, and as the obstruction increases there is frequent or constant urethral tenesmus. Finally the entire urethral mucosa and submucosa may be rolled out so as to resemble a greatly prolapsed anus. The urethral canal dilates, and, as the circulation is obstructed, the rolled-

[1] From Emmet's Principles and Practice of Gynecology.

out structures become œdematous. Cystitis and infection of the kidney are possible results.

When the prolapse is confined to the upper or lower wall of the urethra and the outrolled tissues are from the outlet of the canal, they resemble hemorrhoids, and may, as in the operation for hemorrhoids, be removed by ligature.

When the prolapse is extensive and circular, removal in a mass is prohibited, first, because more prolapsed tissue usually follows and promptly takes the place of that which has been removed; second, because a distressing stricture of the urethra may result.

Treatment.

The treatment of such extensive prolapse is to return the displaced mucosa, if possible, and apply urethral massage—Chapter L. If relief does not follow after a few treatments, it is well to make a small artificial vesico-vaginal fistula, and thereby give the urethra perfect rest. The massage may then become more effective. If these measures fail, the prolapse may be permanently cured by making what Emmet calls a button-hole slit in the urethro-vaginal wall and drawing through this the excessive mucosa and cutting it away. The sutures for closure of the opening are introduced before the excision. During the passage of the sutures a sound should be in the urethra.

SUB-URETHRAL ABSCESS.

This is an abscess in the urethro-vaginal wall. It has been described by Lawson Tait under the name urethral cyst. Its pathology is not fully explained. In the limited number of cases described, the sac occupying the urethro-vaginal wall has varied in size from that of a walnut to that of a hen's egg, and has communicated, by a small opening, with the urethra. The presence of this sac has been explained by Tait as a congenital defect, and by Kelly as a retention-cyst formed by inflammation and occlusion of Skene's ducts and the subsequent perforation of the urethra wall. Inasmuch as Skene's ducts are probably the remnants of Gärtner's ducts, the congenital and cyst theories may both be true.

The tumor has the appearance of pronounced cystocele, is well defined, and very tender to the touch. Pus and ammoniacal urine often escape from it through the urethra. The tenderness is so great that anæsthesia is usually required for examination. If the communication with the urethra is exposed by a urethral speculum and pressure be made upon the sac, one may, as the sac is reduced in size, see its contents forced into the urethra.

Treatment.

The treatment is to dissect out the sac-wall and close the wound with interrupted silkworm-gut or buried catgut sutures. These sutures at the same time should close the urethral opening. Complete anatomical and symptomatic cure follows this operation. If the sac has ruptured, it should be drained by gauze packing held in place by a T-bandage.

CYSTITIS.

In pathology and symptoms inflammation of the female bladder differs in few respects from that of the male. The peculiar sources of infection, the relative shortness of the female urethra, and the easy access to the bladder through the vesico-vaginal wall, however, give to the etiology, diagnosis, and treatment a clear gynecological significance.

When the diagnosis of cystitis was based upon the presence of pus in the urine and painful and frequent urination, its treatment gave less satisfaction to the physician and less relief to the patient than that of almost any other inflammatory disorder. Now these symptoms, pyuria and painful and frequent urination, are recognized as results not only of inflammation of the bladder, but also of a variety of other lesions, especially lesions of the ureter, kidney, and urethra. Moreover, the cystitis itself, which is often thought of as a distinct disease, is now almost relegated to the rank of a symptom, and is properly considered solely in its relations to certain deeper lesions which individually or collectively may underlie and perpetuate it or may result from it. Within a single decade the management of this symptom has risen from the plane of empiricism and has taken its place upon the scientific basis of pathology. This change has come about chiefly as the result of two causes:

Etiological investigations, especially including bacteria.

Improved instrumentation in diagnosis and treatment.

Etiology.[1]

In addition to most of the sources of infection common to cystitis in the male, the female bladder is more subject to concurrent infection from the same causes which give rise to infection of the reproductive organs. The susceptibility is increased during the recurring physiological congestion of menstruation and especially during the puerperal state. Furthermore, infection may readily spread from the reproductive to the urinary organs. Vulvitis, for example, may extend to the urethra, bladder, and ureters. Such extension to the urinary organs, however, is somewhat retarded by the fact that the urinary tract is freely washed by a downward current of urine and by the further fact that the urine, being acid, is a hostile medium for about 90 per cent. of pathogenic bacteria. A not infrequent predisposing cause of cystitis is stone in the bladder.

It is most important to distinguish clearly the predisposing from the exciting causes. Among the predisposing causes are:

1. Pathological urine.
2. Retention of urine.
3. Tumors.
4. Foreign bodies, especially stone.
5. Trauma. Rupture of pelvic abscess into bladder.
6. Any local or systemic cause of congestion or blood-stasis.
7. Rheumatism, uric acid diathesis.

[1] Senn. Transactions American Surgical Association, 1898. Consulted.

These were formerly considered the essential causes of cystitis.

Vastly predominating at least among the exciting causes are the pathological bacteria and their products. The bacteria most frequently found are:

1. Bacillus coli communis.
2. Gonococcus.
3. Bacillus tuberculosis.

The bacteria less frequently found are:

1. Proteus vulgaris, Hauseri.
2. Staphylococci pyogenes.
3. Streptococci pyogenes.
4. Diplococcus pyogenes.
5. Typhoid bacillus.

It is generally agreed that the gonococcus and bacillus tuberculosis are prone to attack the healthy bladder, and that they require little if any predisposing causes. On the other hand, a normal bladder is said to offer much resistance to the other bacteria—that is, they do not become active except in conjunction with definite predisposing causes.

Ammoniacal urine is known to result from the decomposing action upon urea of certain bacteria, notably the proteus vulgaris. The frequent association of alkaline ammoniacal urine with cystitis has given rise to the more or less common impression that the disease depends upon the irritating action of urine which has undergone ammoniacal decomposition, and that such decomposition is necessarily associated with cystitis. Johannes Miller,[1] of Wurtzburg, was the first to overthrow this idea. He showed that in 73 per cent. of the cases of cystitis the urine was acid. Soon after the observations of Miller, Melchior[2] reported the results of sixty-two very accurate observations. He found that ammoniacal decomposition was only a minor phenomenon, and that in many of the severest forms of cystitis acid urine was present even to the time of death. Almost all investigators now reach the uniform result that the bacillus coli communis, or a very closely related microbe, is the one most frequently found in cystitis. Out of one hundred and twenty cases collected by Rostoski this germ was found in eighty cases. Whenever the bacterium coli communis was found alone the urine was acid; whenever proteus vulgaris was found it was alkaline. Alkalinity with bacteria coli communis is said to be always due to association of other microbes.

Instrumentation.

Within a few years the cystoscope has revolutionized our knowledge of the pathology, diagnosis, and treatment, not only of cystitis, but of many other hitherto more obscure urinary disorders.

In former times, when the principal factors in etiology were stricture of the urethra, foreign bodies in the bladder, and, in the male, enlargement of the prostate, and when there was no means of viewing the mucosa, the finger through the dilated urethra and the sound were the only and rather dubious means of exploring the bladder. Digital exploration with its attendant dangers was then common

[1] Rostoski. Deutsche medicinische Wochenschrift, S. 235, 1898.
[2] Monatsbericht über den Gesamtleistungen, Heft 10.

practice. As late as 1883 Sir Henry Thompson,[1] in his work on *Digital Exploration*, reported as the result of two years' observation by that method a series of over thirty cases of tumor in the bladder upon which he had operated. Most significant in contrast is the report of Alexander Stein,[2] two years earlier, in which he was able to collect from all the literature, including post-mortem observations, only about twenty cases.

By means of the cystoscope the entire interior of the bladder may be brought into view; foreign bodies, tumors, and other pathological changes may be recognized, and the ureters and the pelvis of the kidney may be explored. The instrument had often revealed the presence of stones, tumors, and ulcers which had entirely escaped detection by the sound. Numerous cases in which cystitis is of only secondary importance to other associated lesions, such for example as tumors, tuberculous ulcers, and piles, or hemorrhoids of the bladder, are now daily observed by the cystoscope.

Cystoscopy is also of great value in preventing blind and meddlesome treatment for a class of cases which present the subjective symptoms of cystitis, but in which inspection fails to show any lesion whatever of the bladder mucosa.

The value of the instrument is also incalculable when only limited areas are diseased; for example, in case of mild inflammation of the trigone and in fissure at the neck of the bladder. Under such conditions the operator, instead of treating the entire vesical mucosa by means of injections more or less strong, may direct any desired application to the diseased part only.

Pathology and Diagnosis.[1]

Cystitis, in the first place, must be differentiated from simple irritability of the bladder; a condition found in neurasthenic subjects. The diagnosis and treatment are usually those of some underlying neurosis.

The attempt will not be made to differentiate all the phases and varieties of cystitis, but rather to outline the more pronounced types.

In the beginning of cystitis the cystoscope shows the bloodvessels to be less sharply defined than in health. Soon the normal light pink, almost whitish, color of the mucosa assumes a deeper and deeper hue until the sharp demarcation between the vessels is lost and the whole surface is finally of a uniform deep red. The epithelium may be cast off in small particles from circumscribed areas either narrow or broad, and the surfaces thus exposed may take on a granular appearance. Finally in severe cases one may observe excessive swelling and œdema of the bladder wall and pus coagulation. The urine in such cases contains epithelial detritus and pus cells in large quantities.

The frequency of mixed infection and the presence of other difficulties may render it impossible to distinguish between all the different bacteriological varieties; it is, however, usually possible and is often desirable to differentiate the tubercular from other varieties, especially from the gonorrhœal.

[1] Belfield. Am. Gyn. and Obstet. Journal, Jan., 1899. [2] Ibid.

DIFFERENTIATION OF TUBERCULAR FROM GONORRHŒAL CYSTITIS.

Tubercular Cystitis.	*Gonorrhœal Cystitis.*
1. Located chiefly about the trigone.	1. Not at all so confined.
2. Inflammatory reaction zone absent.	2. Clear inflammatory reaction zone, later changing to dull-brown color.
3. Local tubercular cystitis not common.	3. Of common occurrence both local and general.
4. Characterized by presence of small tubercles situated about the trigone and ureteral orifices.	4. Characterized early by insular areas of reactive inflammation, with healthy or nearly healthy intermediate mucosa. Later insular areas become confluent and extend over whole mucosa.
5. No projecting tufts of pus.	5. Projecting tufts of gonorrhœal pus are apt to be present. In chronic stage regions of elevation may be excavated by ulceration.
6. No subperitoneal extravasation of blood.	6. In very acute stage there is subperitoneal extravasation of blood.
7. Bacillus tuberculosis.	7. Gonococcus.
8. Often extension from kidney and from general tuberculosis.	8. Extension from vagina, vulva, or urethra.
9. History of tuberculosis.	9. History of gonorrhœa.

The Pathology of the Initial Stage of Tubercular Cystitis shows:

1. Diffuse or circumscribed swelling and redness of the mucosa.
2. Small grayish tubercles or nodules.

The Pathology of the Advanced Stage of Tubercular Cystitis shows:

1. Larger nodules and deep ragged ulcers.
2. Trigone, base, and posterior wall of the bladder most affected; disease may extend over the entire bladder.
3. Bladder wall thickened and contracted.
4. Urine contains blood, pus, and tubercle bacilli.
5. Disease may end fatally in few months or may continue for years.

The Diagnosis of Tubercular Cystitis is made as follows:

1. Non-gonorrhœal cystitis in a phthisical patient is usually tubercular.
2. Non-gonorrhœal cystitis in young persons is usually tubercular.
3. Chronic ulceration of the bladder is usually tuberculous.
4. Finding of the bacillus tuberculosis in the urine or tissues is the only absolute diagnostic sign; to obtain tissues for microscopic examination, curette the ulcerated surfaces through the endoscope.

Classification.

In our present state of knowledge of the subject a perfect classification is impossible. Numerous classifications have been proposed.

Anatomical Classification. According to the special structures involved, this comprises: pericystitis, paracystitis, interstitial cystitis, and endocystitis. The difficulty, not to say frequent impossibility, of separating these varieties one from the other and the fact that two or

more usually coëxist render this classification, although diagrammatically attractive, is clinically impossible. There are no sharp lines of demarcation between the anatomical forms.

The Pathological Classification includes numerous varieties, such as catarrhal, suppurative, ulcerative, hemorrhagic, exudative, exfoliative, and fissure cystitis. These, however, are rather phases and possible stages than distinct varieties of the inflammatory process.

Bacteriological Classification. This might comprise as many forms as there are varieties of infective microbes. The principal bacteria have already been mentioned. This classification, although quite attractive in the laboratory, is often impractical at the bedside. It is possible, however, that the more exact knowledge of the future may give to it the status of a scientific working guide.

These various classifications, however, from the standpoint of nomenclature are very convenient. Such words as gonorrhœal, acute, chronic, suppurative, and interstitial are useful for purposes of description and to designate the various forms and phases of the infective process. For example, we should use the word endocystitis to describe not a distinct lesion independent of the rest of the bladder, but rather an essential part of an inflammatory process.

Certain so-called clinical and pathological forms and phases of cystitis may be designated as follows, and have great diagnostic significance:

1. Superficial cystitis—catarrhal.
2. Suppurative cystitis.
3. Ulcerative cystitis.
4. Exudative cystitis.
5. Exfoliative cystitis.
6. Fissure cystitis.
7. Foreign-body cystitis.
8. Leucoplakia cystitis.

1. Superficial Cystitis. A large proportion of the cases of chronic inflammation are of this variety. It is generally called catarrhal cystitis; the term should be restricted to surface infection and to cases in which the product of inflammation comes from the superficial epithelial elements of the bladder mucosa. The disease is marked by moderate swelling, redness, and exfoliation of epithelial cells; the urine contains a moderate amount of pus and is usually acid. Erosions, ulcerations, and, as a consequence, more abundant suppuration may follow—that is, cystitis, originally catarrhal, may become distinctly suppurative. Great alkalinity of the urine indicates a rather advanced stage, when the cystoscope will reveal a deposit of grayish-white color containing muco-pus.

2. Suppurative Cystitis. In this form the inflammation may have been diffuse from the beginning and have involved both the superficial and deeper structures of the bladder wall. As well stated by Senn, the microbic infection is of sufficient intensity to destroy the protoplasm of the pathological products of the inflammation and thus transform the leucocytes and epithelial and connec-

tive-tissue cells into pus corpuscles. The urine contains an abundance of epithelial cells and pus. The ulcerative process may involve the deeper structures and in exceptional cases may lead to perforation. The urine is acid, or, if ammoniacal, may be so from decomposition due to the intercurrence of microbes other than those which produced the original infection. In the ammoniacal urine will often be found the diplococcus pyogenes and the proteus vulgaris. Suppurative cystitis, both in its acute and chronic stages, is prone to invade the ureters and kidneys. In fact, chronic uncomplicated suppurative cystitis is rare. The cystoscope reveals the local conditions as already described.

3. Ulcerative Cystitis. The ulcerative phase of cystitis has already been mentioned as a later stage of the catarrhal or suppurative varieties. The term is here used to designate that variety in which ulceration is the initial or, at least, a very early factor. The infection, as described by Senn, appears to be of a peculiar kind and limited in extent. The resulting inflammation leads quickly to circumscribed necrosis. There is usually a single circumscribed ulcer, the so-called 'simple' ulcer of the bladder. This form of cystitis is quite rare and resembles in many respects gastric ulcer and the round duodenal ulcer.

The first symptom is increased desire to urinate; intermittent hæmaturia then appears. The ulcer may become incrusted with phosphates. Fragments of the deposit break off now and then, and may be passed with painful paroxysms, or may be retained to serve as nuclei for calculus formation. Finally the bladder becomes contracted and the mucous membrane extensively ulcerated. Ureteral and renal lesions may now arise. This form of cystitis is undoubtedly the result of an infection through the blood, the inflammation attacking the tissues around an infected embolic infarct and reaching the surface of the bladder by a process of ulceration. Ulcerative cystitis, like gastric and duodenal ulcer, is found quite frequently in young male adults, less frequently in the female. There are usually no antecedent or attending predisposing local causes. In the diagnosis the cystoscope is indispensable.[1]

4. Exudative Cystitis. This is characterized by the formation upon the bladder mucosa of a so-called membrane; hence it is usually designated by the rather confusing descriptive terms, "membranous," "diphtheritic," "croupous," or "fibrinous." The exudative membrane is the product of the inflammation; it is in fact apt to be the product of extensive necrotic changes and as such indicates a grave lesion. There may be extensive destruction even in the musculature and especially in the deep bloodvessels and lymphatics. The urine is usually alkaline. The disease has been chiefly observed in puerperal women. The urine contains fibrinous shreds or cast-off patches of membrane. Cystoscopic examination reveals a yellowish-white membranous formation which may often be picked off by means of forceps passed through the cylindrical cystoscope.

5. Exfoliative Cystitis. This variety is analogous to so-called

[1] Adaptation from Senn.

PLATE VI.

Figure 1. Cystitis originating in the Trigone and extending to adjacent surfaces. Magnified.

Figure 2. Normal Bladder Mucosa. Mag

PLATE VII.

Figure 1. Linear Ulcer of Bladder Mucosa. Magnified.

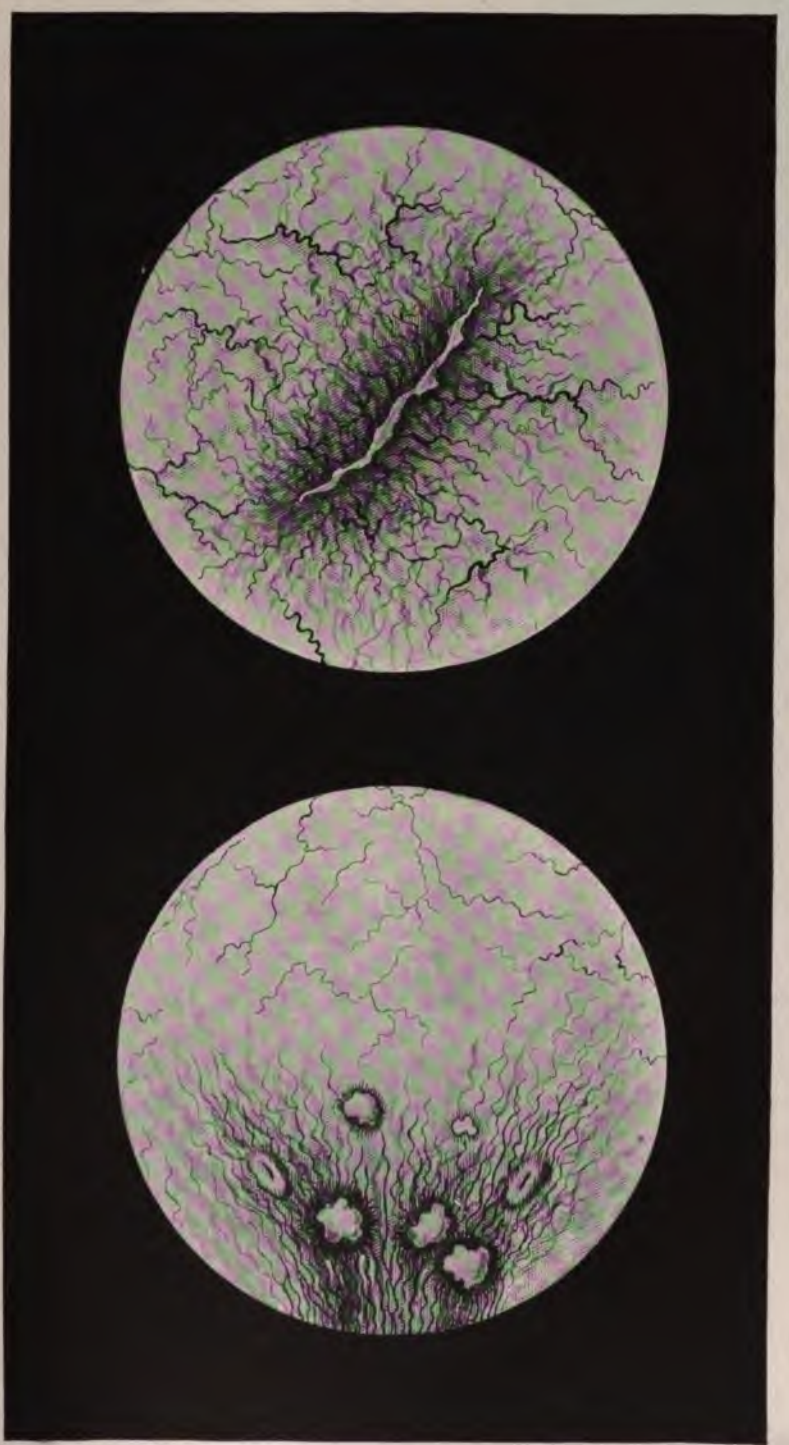


Figure 2. Ulcerated Patches in the Trigone. Magnified.

dissecting metritis and dissecting vaginitis. The infective process and inflammatory reaction are most virulent and intense and result in the destruction and detachment of the mucosa, and together with it sometimes of the muscular layer of the bladder; these may be expelled in fragments with the urine or may have to be removed from the bladder by a surgical procedure. It is the most grave and virulent form of cystitis, and is apt to be fatal. The conditions are like those of exudative cystitis intensified. The diagnosis between the two forms depends upon the macroscopic and microscopic character of the masses removed or thrown off from the bladder. The disease was early and fully described by Boldt.[1]

Etiology. This form of cystitis is usually associated with one or more of the following mechanical conditions:

1. Retroversion of the gravid uterus in 50 per cent. of cases.
2. Protracted birth in 25 to 30 per cent. of cases.
3. Incarcerated pelvic tumors.
4. Retention of urine, especially in puerperal cases, common.

Symptoms.

1. Membrane expelled in urine.
2. Membrane may obstruct the urethra, causing retention.
3. Membrane in the bladder causes vesical tenesmus; expulsion of it causes pain and straining.
4. Death may occur from: *a*, sepsis; *b*, uræmia; *c*, pyelitis; *d*, peritonitis.

6. Fissure Cystitis. Fissure cystitis is caused by secondary infection of a traumatism at the neck of the bladder or in the trigone. As seen through the cystoscope, the fissure is usually covered by a brownish or yellowish exudate surrounded by an œdematous area.

7. Foreign-body Cystitis. Cystitis caused by foreign bodies varies with the character of the body and the conditions of infection. A smooth body may be tolerated without subjective symptoms. A rough or angular substance may produce trauma and thus open the way to any form of infection.

8. Leucoplakia Cystitis.[2] This is characterized by the appearance of grayish or whitish small circumscribed areas situated usually in the trigone. The epithelium has undergone changes which render it opaque and which have been likened to the changes of keratitis. The cystoscope reveals a number of grayish-white reflecting spots of a diameter approximating one-fourth inch. These spots while desquamating are below the level of the surrounding mucosa; after desquamation has ceased they become flush with the mucosa. A most pronounced subjective symptom is an intolerable and almost constant desire to urinate. Micturation may be attempted as often as once in fifteen minutes through the day, and almost as frequently during the night. Leucoplakia results from long-continued chronic areas of inflammation; it may be the starting-point of general cystitis.

[1] American Journal of Obstetrics, June, 1889.

[2] Adaptation from Kolisher.

Treatment.[1]

The treatment of cystitis falls under four heads:

1. Prophylactic.
2. Medicinal.
3. Topical.
4. Surgical.

Prophylaxis.[2] Numerous autopsies upon subjects who have not suffered from cystitis have shown a hyperæmic state of the bladder so marked that it must have been of long duration, yet which had not gone to the extent of infection and inflammation. The explanation must be that the infective element had not been present, or if present had not become active. On the other hand, the question has been raised and usually answered in the negative whether the mere presence of infective microbes alone, bacillus tuberculosis and gonococcus excepted, can easily produce cystitis. It is commonly agreed that infection must usually depend upon: first, an abnormal condition of the soil which renders it susceptible; second, upon the presence of the bacterial exciting cause. A twofold indication is obvious: to keep the bladder in a state of resistance, and to avoid the introduction of infective material.

Susceptibility to infection may result from either systemic or local states. The systemic conditions are often the result of faulty elimination and consequent defective circulation. Hepatic and cardiac disorders, kidney insufficiency, constipation, gout, lithæmia and cholæmia, anæmia, diabetes, rheumatism, at once suggest themselves. These disorders call for hygienic and medical treatment, for judicious elimination and nutrition. At the risk of seeming to advocate routine measures, one may suggest the value of mercurials and salines. It is clearly essential to enforce judicious rules for food, exercise, and sleep.

The introduction of the catheter under the sheet, its passage without preparatory disinfection of the vulva, the use of the aseptic catheter, and the slight traumatism which its use may cause, and the almost certain ingress of septic matter through such traumatism, are well known to every intelligent physician. But unfortunately many intelligent physicians, although intellectually cognizant of the facts, are not alive to their importance.

The possible relations of parturition to cystitis are most significant; among such relations are those which arise from certain pelvic defects, such, for example, as contraction or excessive inclination of the pelvis; such defects may retard or obstruct labor, and thereby cause prolonged pressure of the child upon the bladder, a condition full of danger.

Gestation in a retroflexed uterus finally enlarges the uterus until it becomes impacted under the sacral promontory, then pressure of the cervix upon the neck of the bladder forces the bladder against the pubes, prevents complete evacuation, and results in the retention of residual urine. This urine necessarily becomes decomposed, and is then a most favorable culture-ground for bacteria; the almost inevitable result is cystitis. If there be present in combina-

[1] Adaptation from Kollsher. [2] Kletsch, Am. Gyn. and Obstet. Jour., 1899. Consulted.

tion the three elements, congestion, decomposed residual urine, and bacteria, even though any one alone might be ineffective, infection is almost unavoidable. The necessity for prompt replacement of the displaced gravid uterus is unquestioned.

Medical Treatment. The medical treatment already discussed as a part of the prophylaxis has, especially in connection with other forms of treatment, great value. The principles are necessarily those of general internal medicine. The particular indications have reference to the use of such drugs as may change the quality or increase the quantity of the urine. If the urine is strongly acid, for example, it should be diluted by the free drinking of fluids or rendered less acid by the use of alkalies; if alkaline, its reaction may be modified by the use of acids. To secure a proper degree of acidity, benzoic acid, alone or combined with borax and dissolved in cinnamon-water, is a classical and useful remedy. The indication to relieve subjective symptoms is twofold: first, to allay suffering and nervous irritation; and second, to render the patient less intolerant of topical and surgical treatment.

In superficial mild cystitis, with frequent urination and mild painful contractions of the bladder, prompt relief sometimes follows the daily application of a rectal suppository containing two or three grains of ichthyol. In more aggravated cases opium may be substituted for ichthyol. The irritating effects of concentrated urine may be avoided by the frequent drinking of water. Lest there be frequent urination during the night, the drinking may be largely confined to the morning and early afternoon hours. To secure good sleep let the ichthyol suppositories be used two or three hours before bedtime, and followed if necessary by the opium or morphine suppositories at bedtime.

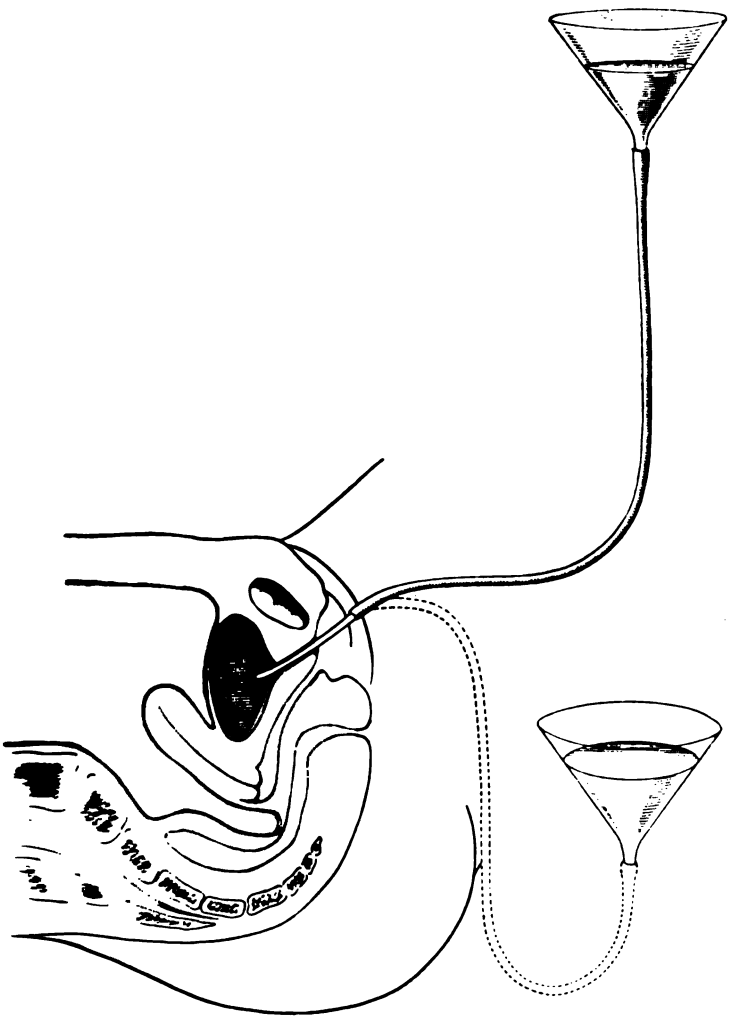
The bowels should be kept normally free by mild laxatives. Drastic cathartics should be avoided. Uva ursi, triticum repens, the benzoate salts, buchu, eucalyptus, and many other time-honored and classical remedies may be useful. Eurotropin is highly commended. The writer has occasionally been gratified at the disappearance of irritation of the bladder after the administration three times a day for a number of weeks of calomel in doses of one-tenth to one-twentieth of a grain supplemented by the free use of natural or artificial mineral waters or of pure water. Rest, especially in the acute stage, is highly important.

Topical Treatment. The washing out of the bladder as a routine procedure is not approved. Irrigation is, however, positively indicated when necessary for the removal of loose irritating shreds or other foreign matter.

The superficial forms of cystitis respond promptly to topical treatment. If the cystitis is general and superficial, a 10 per cent. emulsion of iodoform in oleum sesame may be thrown into the bladder with a hard-rubber syringe. If, after two or three applications of the emulsion, there is sufficient toleration, four ounces of nitrate of silver solution may be injected into the empty bladder and immediately replaced by free irrigation of normal salt solution. The strength of

the silver solution should vary according to the toleration of it. Begin with 1 per cent. and cautiously increase the strength if necessary even to 5 per cent.; some practitioners say 10 per cent. The treatment may be

FIGURE 193.



...bladder. The irrigation may be repeatedly made by alternately raising ... when the funnel is raised the fluid flows into the bladder; when ... the funnel.

... three days. Oftentimes two or three mild ... cure.

... infection is localized, and when localized is ... trigone or inner end of the urethra. The ... should then be applied only to the affected part.

It may be made of any desired strength by means of a cotton swab introduced through the cylindrical cystoscope and kept within bounds by the immediate instillation of salt solution. Mild infections in the trigone often yield completely to a single treatment. Fissure cystitis may be promptly and permanently cured by this means, but aggravated cases sometimes require the solid stick. Accompanying urethritis should be treated simultaneously with the cystitis.

When the infection has caused deep infiltration into the bladder wall, as in exudative or diphtheritic cystitis, the treatment is to be conducted in two stages—first, wash out the bladder to remove the shreds and other putrid material; second, apply the disinfectant. In washing out the bladder use small quantities of fluid and repeat until the fluid returns clear; then apply the disinfectant, preferably the silver nitrate.

If the secretion on the bladder wall is mucoid in character and stringy, it is better to use normal salt solution than pure water. When the bladder is so painful as to resist all efforts at treatment it may be anæsthetized with 10–20 c.c. of a 4 per cent. solution of antipyrin. This should be left in the bladder about twenty minutes. If treatment leaves the bladder very painful, cupping, hot applications, or opium suppositories are indicated.

Cystitis with granulations or ulcers require a very long time for healing; for this purpose nothing is better than silver nitrate solution or the solid stick.

In exfoliative cystitis any systemic cause of the disturbance should, if possible, be removed. The membrane when it becomes gangrenous should be taken away by means of forceps. A permanent catheter should then be inserted both for protection to the bladder from the results of distention and for the injection of antiseptic solutions. In these cases the systemic condition is very grave and requires the maximum support.

Surgical Treatment. The surgical procedures in the treatment of cystitis are as follows:

1. Dilatation of the urethra.
2. Vaginal cystotomy, also called colpo-cystotomy.
3. Curettage of the bladder.
4. Lithotrity.
5. Extra-vesical operations.

1. Dilatation of the Urethra. The indications for this operation are as follows:

A. To cure localized cystitis in the region of the trigone, commonly called trigonitis, and fissure at the neck, called fissure cystitis. The mode of cure in fissure cystitis is doubtless similar to that of anal fissure by dilatation of the sphincter ani muscle.

B. To enable the operator to see and treat surgically or topically vesical ulcers, vesical hemorrhoids, small growths, and other affections of the bladder, and to permit the crushing of stone.

The dilatation is made by means of the urethral dilator, Figure 44. In passing the instrument one should note the extreme natural diameter of the urethra and then limit the dilatation to about twice

this diameter. Further stretching is apt to rupture the urethro-vaginal wall, and may cause permanent incontinence of urine. The No. 16 cystoscope, Chapter III., measures the extreme safe diameter for the average urethra. Exceptional cases may arise in which this amount of dilatation could safely be increased or in which it might be dangerous. Whatever stretching can be done without tearing is safe. The dilatation may be started with the conical dilator, and completed with the cystoscope.

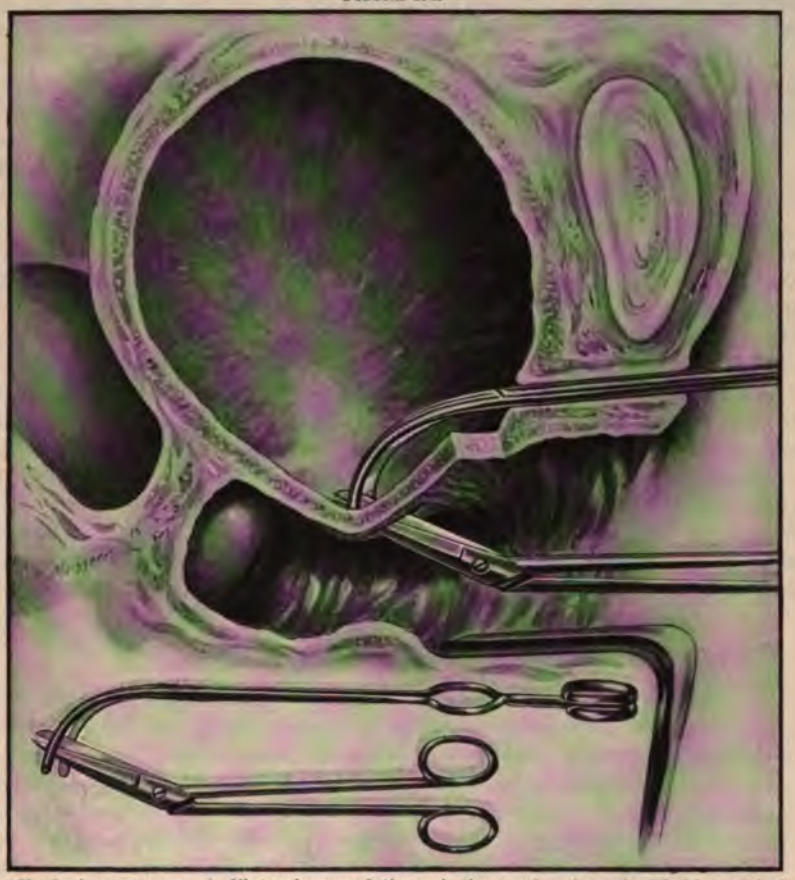
2. Vaginal Cystotomy. This is the formation of an artificial vesico-vaginal fistula. It opens the way to intravesical topical treatments and operations. Through this opening tumors may be removed and diseased surfaces cauterized and curetted. In chronic cases of great, long-continued, and unrelieved suffering colpo-cystotomy has, by giving the bladder complete rest, furnished immediate and unspeakable relief. The operation has two objects—first, palliative; second, curative. In a certain proportion of cases the disease in the bladder and upper zones of the urinary tract is so extensive that the operation can only be palliative—that is, an anatomical cure is sometimes impossible. In some of these cases the bladder is permanently contracted to the capacity of perhaps one-half ounce. No one would think of making a secondary operation for the closing of the fistula under such conditions. In many other cases the artificial opening may be only temporary. It gives the best opportunity for direct local treatment to diseased parts of the bladder, and for a most effective vesical douche, which can be thrown in through the urethra and allowed to flow out through the fistula and vagina. Very many cases of otherwise intractable chronic cystitis have been cured by this method with subsequent closure of the fistula and the cures, if not anatomically complete, were at least symptomatically satisfactory. In such cases the much contracted bladder may finally even resume its physiological calibre.

Operation. The patient is preferably in Sims' position, with the anterior vaginal wall exposed by Sims' speculum. A large sound is introduced through the urethra, and its point pressed against the vesical mucosa in the middle of the long axis of the vesico-vaginal septum. An incision is now made upon the sound through the septum with the knife or scissors. The point of the sound will then pass through into the vagina. The opening thus made is enlarged so as to extend one inch in the median line of the long axis of the vesico-vaginal septum. Its upper end will be about one-half inch from the anterior wall of the cervix uteri, and its lower end the same distance from the neck of the bladder. The margins of the vesical and vaginal mucosa are then united by fine interrupted catgut sutures.

The accompanying illustration shows a device which renders the operation both precise and simple; it consists in the introduction of a small uterine dilator through the urethra into the bladder. The curved blades of this dilator are turned toward the vaginal wall, the points of the blades are pressed against the vesico-vaginal septum in the median line, that is, on a line through which the bladder is to be opened. The blades of the dilator are now slightly separated, and

the septum, being thus fixed, is incised as shown in the illustration. The incision may be made by the scalpel or scissors with accuracy and without danger of wounding the opposite wall of the bladder.

FIGURE 194.



Vaginal cystotomy. A dilator is passed through the urethra into the bladder, and the blades of it are pressed against the vesico-vaginal septum at a point in the median line midway between the uterus and urethra and separated. The vesico-vaginal septum is incised by means of the scalpel or pointed scissors, which are forced through the septum between the blades of the dilator. The point for incision is determined by the position of the dilator, and can be easily felt by means of the index finger in the vagina. In the lower part of the figure the dilator and scissors are shown complete, and in the position in which they are when the incision is made.

The operation of vaginal cystotomy is the device of T. A. Emmet.

In some of the less severe cases sufficient improvement takes place in a few months to permit the closure of the fistula, with permanent relief.

In the more chronic cases in which the bladder walls are much thickened, deeply infected, disorganized, and contracted, and particularly when the cystitis is complicated with pyelitis and nephritis, the fistula should remain open, for its closure will inevitably be followed by relapse.

If cystitis be complicated by stone in the bladder, the treatment may well be an artificial vesico-vaginal fistula, instead of a crushing operation through the urethra. The fistula is preferred for two reasons : first, the crushing operation may involve objectionable dilatation of the urethra ; second, the fistula is useful as a means of drainage for the cure of the cystitis.

Colpo-cystotomy may be further indicated for the removal of foreign bodies ; it also furnishes an opening for the cauterization or curettage of ulcers.

3. **Curettage of the Bladder** may be done through the tubular cystoscope, but better through an artificial vesico-vaginal fistula. It is indicated in indolent ulcers, especially those of tubercular origin.

4. **Lithotrity and Lithotomy.** A stone in the bladder may be crushed through the urethra or removed through an artificial vesico-vaginal fistula. A small stone, or rather foreign body may be removed entire through the dilated urethra. Prompt relief from cystitis usually follows.

5. **Extra-vesical Operations.** Parametritic, perimetritic, or tubal abscess may by rupture into the bladder cause cystitis. Incision, evacuation, and drainage of the pus cavity, or removal of the pus sac, is usually followed by prompt cure.

As a final stage in the treatment of cystitis, the bladder if contracted may often be made to return to its normal size by methodical distention with increasing quantities of salt solution ; but this should only be undertaken after the cystitis has been cured and the patient is free from the dangers of a recurrence of the malady.

Summary.

1. The conditions which were formerly considered the prime causes of cystitis have receded to their proper place, and must be estimated only as predisposing causes.

2. The recognition and appreciation of pathogenic bacteria as the exciting causes of cystitis is essential to a scientific understanding of the pathology, etiology, and treatment.

3. Alkalinity of urine depends upon the action of certain bacteria, notably the proteus vulgaris, in the decomposition of urea. The bacillus coli communis, which is one of the most frequent causes of cystitis, is one of a class which does not decompose urea and therefore does not produce ammoniacal urine. Contrary to the older opinion, alkalinity is not the rule ; on the contrary, in the majority of cases the urine remains acid. Alkalinity if present is the work of other microbes secondarily introduced.

4. The classical symptoms of vesical pain, frequent urination, and pus in the urine are wholly inadequate as a basis for the diagnosis of cystitis. Moreover, the condition called cystitis has receded from the rank of a distinct disease to that of a symptom, and should be so regarded. The mere recognition of the fact that cystitis exists is not a diagnosis ; a fact is not a diagnosis. Indeed, the recognition of

cystitis may by contrast with the recognition of its complications be of very minor importance.

5. The diagnosis must comprehend not only the presence of infection in the bladder, but, what is more important, it must embrace the source, routes, type, complications, and variety of the associated inflammatory reaction. Simple uncomplicated inflammation of the bladder is rare.

6. The endoscope and cystoscope can alone open the way to efficient exploration and diagnosis, can alone define the indications for topical or surgical treatment; what is more essential still, they alone can prepare the way for the examiner to distinguish between cystitis and a wide variety of other urinary affections of the bladder, urethra, ureter, and kidney. One is astounded at the revelations of the cystoscope in the recognition of most important lesions which must otherwise have passed unobserved.

7. The washing out of the bladder as a routine measure is not approved. The injection of disinfectants is indicated only in general or nearly general cystitis. For localized cystitis direct applications to the part affected should be made through the endoscope.

8. Dilatation of the urethra is indicated for localized cystitis at or near the neck of the bladder. The efficiency of the procedure for such localized cystitis has given it an undeserved recognition in the treatment of general cystitis which under cystoscopy it cannot now retain.

9. The most valuable disinfecting topical application in cystitis is the nitrate of silver.

PYELITIS AND NEPHRITIS.

This topic has a special gynecological significance in the matter of diagnosis and treatment by means of the cystoscope and the ureteral catheter, which have been described in Chapter III. The ureteral catheter[1] is introduced into the ureter through the cystoscope. By this means one may wash out the urinary tract up to and including the pelvis of the kidney; as a result of this treatment apparent cures in cases of hydro-ureter and pyo-ureter have been recorded.

To wash out the ureter the patient is placed in the knee-breast position; the ureteral catheter, with a short piece of rubber tubing attached, filled with a sterilized boric-acid solution, and clamped to keep the solution from running out, is passed through the cystoscope into the ureter and the cystoscope withdrawn. A sterilized glass funnel, with an attached rubber tube eighteen inches long, is filled with the irrigating solution, and the two rubber tubes are connected by a small glass tube with a point sufficiently fine to fit into the tube on the catheter. By raising the funnel above the level of the body the fluid is made to flow through the ureter into the pelvis of the kidney. When the funnel is dropped below the level of the body the fluid returns; thus, by alternately raising and lowering the funnel, the fluid is made repeatedly to flow back and forth and to wash out the

[1] Adaptation from Howard Kelly. Diseases of the Female Bladder and Urethra.

ureters and pelvis of the kidney. The fluid may, if desired, be changed one or more times during the treatment. The apparatus is similar to that shown in Figure 193.

Purulent or other accumulations in the ureter should be permitted to run out through the catheter before the washing out.

The practical value of the ureteral catheter as a therapeutic agent remains to be estimated. The attempt to cure chronic infection in the uterus, nose, throat, and other mucous cavities by washing them out with various fluids has not generally been followed with great success. It is probable that the ureter and pelvis of the kidney will not be an exception to the rule. Kelly puts forth a word of wise precaution on the urgency of making all ureteral manipulations with extreme gentleness. The catheter should never be pushed up higher than it will readily pass, for such force would injure the mucosa and might be followed by dangerous, even fatal infection.

PART III.

TUMORS, TUBAL PREGNANCY, MALFORMATIONS.

CHAPTER XXV.

TUMORS OF THE VULVA AND VAGINA.

Varix.
Hæmatoma.
Elephantiasis.
Papilloma.
Carcinoma.
Sarcoma.
Fibromyoma.
Lipoma.
Lupus.
Enchondroma.
Neuroma.
Cysts.

Varix.

Varix is an aggregation of dilated or varicose veins in the erectile tissue of the bulbi vaginæ. The varicose state is caused by obstruction to the circulation. This obstruction often arises from direct pressure upon the venous trunks by the gravid uterus. The pressure may be exerted by tumors or by inflammatory exudates. Habitual constipation, portal obstruction, and visceral disease may underlie and perpetuate the disorder; it belongs rather to advanced than to early life.

The tumor is oval, globular, or serpentine, and may grow to the size of a child's head.[1] The surface is irregular and of dark-blue color. The mass temporarily disappears on pressure. The subjective symptoms include a variable pruritus and, especially on walking or standing, a sensation of fulness and weight. Rupture of the distended veins often occurs during parturition; it may be the result of traumatism or may be spontaneous. External rupture may cause dangerous, even fatal, hemorrhage. Subcutaneous rupture into the cellular tissue gives rise to an accumulation of blood called hæmatoma.

The Treatment includes mechanical support of the uterus, if displaced, regulation of the bowels, removal of waist constriction, the application to the varix of a pad held in place by a T bandage, the use of astringent lotions, and, especially during pregnancy, frequent rest. The radical surgical treatment is the same as would be indicated by the general principles of surgery for varix in any other location.

[1] Holden. New York Medical Record, July, 1868.

Hæmatoma.

Hæmatoma is an extravasation of blood, not a new growth, but is described here because it has certain relations with varix and from the standpoint of diagnosis. The Causes have been indicated in the foregoing paragraphs on varix, and in the section on Traumatisms, Chapter XXXIX. The tumor may develop rapidly or slowly even to the size of an orange, is commonly unilateral, globular, elastic, and of a violet color. It is distinguished from pudendal hernia by the absence of impulse on coughing and by non-reduction on taxis; it may terminate by absorption or by suppuration, or the blood-clot may become encysted. The treatment in the early stage is to arrest bleeding by means of pressure and the ice-bag. If an abscess develops, it should be freely opened and drained. A cyst-wall, if formed, should be dissected out and the wound closed by deep sutures.

FIGURE 195.

Elephantiasis of vulva.[1]

Elephantiasis—Pachydermia.

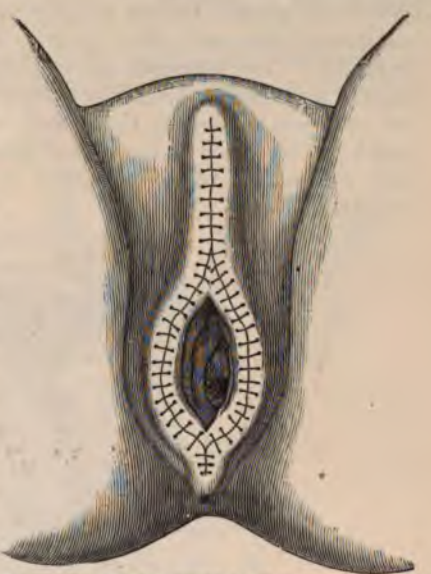
This disease is primarily a chronic recurring lymphangitis. It is associated with hyperplasia of the connective tissue, skin, mucous membrane, and epidermis. The whole process results in the formation of a tumor, often of large size, and is most frequent between the years of puberty and the menopause. It is rare in temperate, common in tropical climates, and epidemic in certain low-lying countries along seacoasts and in the islands of the tropics. An organism called the *filaria sanguinis hominis* has been found in the blood- and lymph-vessels of the affected part, and is believed to be the exciting cause.[2] The tumor may involve the whole or a part of the vulva, most frequently the two labia majora, less frequently the clitoris, and least frequently the nymphæ.

The growth, when large, is apt to be quite pendulous. Its surface

[1] From Bonnet and Petite, Gynecology.
[2] Delafield and Prudden's Pathological Anatomy and Histology.

may be smooth, rough, fissured, warty, or ulcerated. The tumor, especially if ulcerated, gives forth a sero-albuminous exudate. This may be so profuse as to demand frequent change of clothing. Ulceration is common as the result of friction. Cases of twenty years' duration have been recorded. The enlarged labia may reach the enormous weight of fifty pounds. Both labia are simultaneously involved. The inguinal glands on both sides are enlarged. Chyluria is a frequent complication. The disease does not directly impair the general health; it is, however, disabling from its mechanical interference with urination, walking, and coitus.

FIGURE 196.



Appearance of the vulva after operation for elephantiasis.[1]

The Differential Diagnosis from papilloma, carcinoma, sarcoma, fibroma, and lipoma depends upon the clinical history as outlined in the foregoing paragraphs and upon the microscopic finding. Unlike elephantiasis, all these growths are free from any induration of the surrounding skin. Lupus presents more extensive ulcerations, deeper induration, darker color, and has for its essential factor the tubercle bacillus.

The Treatment is excision. The numerous dilated lymph channels increase the danger of septic absorption, and in the operation render the most extreme asepsis imperative.

Papillomata, Condylomata, or Warts.

These growths are characterized by hypertrophy of the papillæ of the skin or mucous membrane, increase of connective tissue, and thickening of the epithelial covering. They are divided into three general classes:

1. Non-specific—simple papillomata—ordinary warts.
2. Gonorrhœal—condylomata acuminata—pointed condylomata—specific vegetation or venereal warts.
3. Syphilitic—flat condylomata.

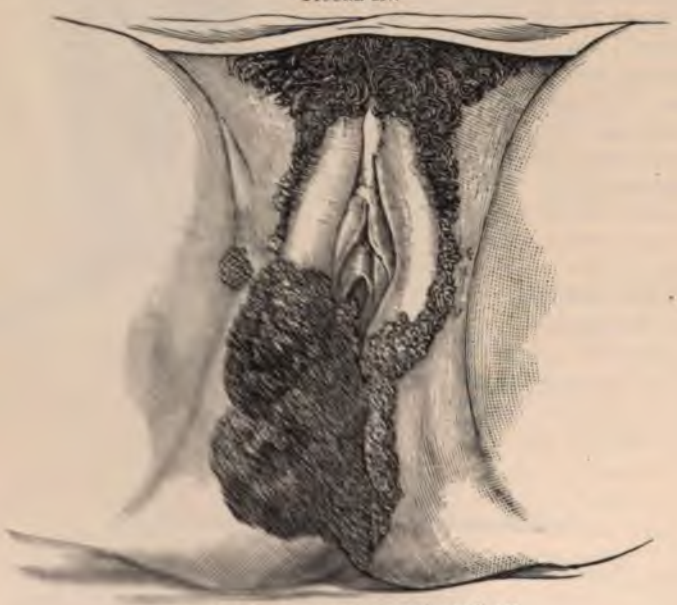
Non-specific, Simple Papillomata, or ordinary warts, are not uncommonly found on the mons veneris—less frequently on the labia. They are of unknown origin, usually of dark-brown color, are not deeply divided, may have a broad base or may be pedunculated, and

[1] Bonnet and Petite, Gynecology.

are not apt to coalesce into large, compact masses. The treatment is excision with the sharp curette and cauterization of the base.

Gonorrhœal Warts, or warts at least associated with gonorrhœa, are found on the vulva, vagina, cervix uteri, perineum, and about the anus. These warts occur singly, in groups, or in cauliflower-like masses. The growth may be so large as to interfere with coitus, urination, or defecation. The surface is soft, moist, of bluish color, and divided into small nodules with pointed ends like a cock's comb. When the growth occurs during pregnancy it is rapid, but may immediately disappear after labor. There is usually a coexistent fetid vaginitis. The question has been raised whether this form of condylomata may not occur independently of the gonococcus, but the clinical evidence, including the results of bacteriological studies, strongly points to at least a coexistent gonorrhœa. Zeisler[1] says that the part played by the gonococcus, except as a predisposing cause, is doubtful.

FIGURE 197.



Simple warty vegetations of the vulva.[2]

The treatment includes, first, thorough cleansing and disinfection of the diseased region; second, the removal of the so-called vegetation with scissors, and cauterization of the base; third, antiseptic dressing and washes until the parts have healed. The danger of puerperal sepsis and ophthalmia of the newborn infant strongly suggests radical measures during pregnancy.

Mucous Condylomata.—modified mucous patches—are of syphilitic origin and may involve large surfaces of the vulva and vagina.

[1] Verbal communication.
[2] Veit, in Pozzi's Treatise on Gynecology.

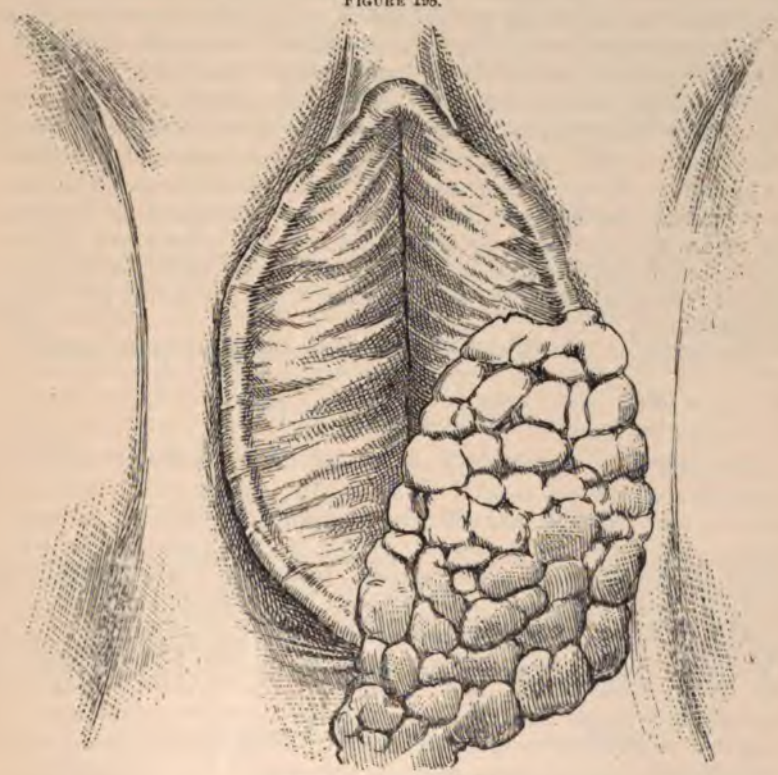
They are soft, grayish, have a broad base, and yield to antisyphilitic treatment.

Carcinoma of the Vulva.

Carcinoma of the vulva is rare, and is apt to be of the pavement-cell variety—epithelioma. The author observed one case of cylindrical carcinoma immediately after the removal of a cancerous uterus. In this case the disease was doubtless transplanted from the uterus to the vagina during the operation. Prompt excision was followed by radical cure.

Pavement-Cell Carcinoma begins as a small, hard, whitish, rough and painless papillary excrescence, situated at any point on the vulva,

FIGURE 198.



Carcinoma of the vulva.

but more commonly on the sulcus between the labia majora and minora. There is first a gradual involvement of the superficial structures around the growth, then rapid ulceration and pain. The inguinal glands on the side corresponding to the disease are involved. The margin of the ulcer is elevated, hard, and of a bluish-red color. The base is granular and covered by a semi-opaque, putrid secretion.

Small, pearly bodies may often be squeezed from the epithelial nests at the base; these nests are highly diagnostic. The labium becomes greatly infiltrated, very hard and thickened, and finally is destroyed by ulceration. The discharge has a most sickening odor. The disease rarely extends to the opposite labium, vagina, or abdominal wall. It may invade the perineal and peri-anal regions. Epitheliomata of the lip and of other parts where skin and mucous membrane meet, offer a close analogy to epithelioma of the vulva.

The diagnosis is chiefly from lupus and syphilis. Unlike cancer, lupus is recognized by the insignificance of the pain, by the relative freedom from foul secretions, by the tendency of the ulcers to cicatrize, by the slight liability of extension to the inguinal glands, and by the slow progress of the disease. Epithelioma destroys life in about two years after the beginning of ulceration. Syphilis may be recognized by the history of infection, by the presence of secondary and tertiary lesions elsewhere, and by the effect of specific treatment.

Cylindrical Cell Carcinoma—Adeno-carcinoma. The swelling begins more deeply in the cellular tissue. It is characterized by irregular-shaped cylindrical cells imbedded in the meshes of connective-tissue fibres. Progress is more rapid than in epithelioma. The tumor more rapidly breaks down, the hemorrhage is frequent and profuse, the ichorous discharge is abundant, the inguinal glands are early enlarged, and systemic effects appear earlier and are more marked. The disease terminates in sepsis and marasmus. Death occurs earlier than in epithelioma.

The treatment is radical excision before glandular involvement.

Sarcoma of the Vulva.

Sarcoma is of mesoblastic origin and is so rare in the vulva as to preclude accurate description. The possible varieties are: first, round cell; second, spindle cell; third, myxosarcoma; fourth, melanosarcoma. They preferably develop in the labia majora, but have been found in the nymphæ. The growth, according to the variety, may be slow, resembling that of lipoma;[1] or ulceration may be early, rapid, and destructive.[2] The usual characteristics of sarcoma of the vulva are rapid growth, late ulceration, variable hemorrhages, and late involvement of the inguinal glands. The systemic breakdown, though more rapid and marked, resembles that of carcinoma. All recorded cases have terminated fatally. Death usually results from rapid involvement of distant organs through the venous current.

The Treatment is removal at the earliest possible date. The author here records a successful operation done more than fifteen years ago for the removal of a spindle-cell sarcoma of the mons veneris. There has been no recurrence.[3]

[1] Henkel. [2] Hildebrandt.

[3] The microscopic examination was by Lester Curtis, Chicago.

Cysts of the Vulva.

The pathology of cysts of the vulvo-vaginal gland has been explained in Chapter XI. under Inflammation of Bartholin's Glands. The only satisfactory treatment of such a cyst is to open the sac, dissect out the sac-wall, and close the wound with sutures.

Fibromyoma of the Vulva.

Fibromyoma belongs to the connective-tissue group of benign tumors, and is therefore of mesoblastic origin. It is composed of fibrous connective tissue and a variable amount of muscular fibres. The histological characters of this tumor will be given more fully under the subject of Fibromyoma of the Uterus. The tumor is commonly small, and, when large, is apt to be pedunculated ; it is smooth, irregular in shape, is not adherent to the skin, and, according to the amount of fluid in the interspaces, may be hard or soft; it is often ulcerated from friction but is rarely the seat of an abscess. The symptoms are mechanical, and are due to weight and pressure. The treatment is excision.

Lipoma—Fatty Tumor of the Vulva.

Lipoma is composed of lobuli of adipose tissue in a fibrous meshwork, and originates in the fatty tissue of the labia majora and mons veneris. It is distinguished from fibromyoma by the greater rapidity of growth, by the lobulated surface, and by a peculiar sensation to the touch. This sensation is such as would be expected from a wad of cotton under the skin. Lipoma may grow to the weight of ten pounds, may extend to the knees, and may be pedunculated ; it has been mistaken for hernia. The treatment is excision.

Tuberculosis—Lupus of the Vulva.

This disease, from the pathological point of view, would be classed as tubercular inflammation of the vulva. The tumor-like mass, however, presents physical characteristics in common with certain tumors; hence, from the clinical and comparative standpoint, the disease may be regarded as a new growth. See Tubercular Vulvitis, Chapter XI.

Enchondroma and Neuroma of the Vulva.

Enchondroma and neuroma are surgical curiosities. Simpson[1] has reported the only authentic case of neuroma. Schneevogt and Bartholin have each recorded a case of enchondroma.

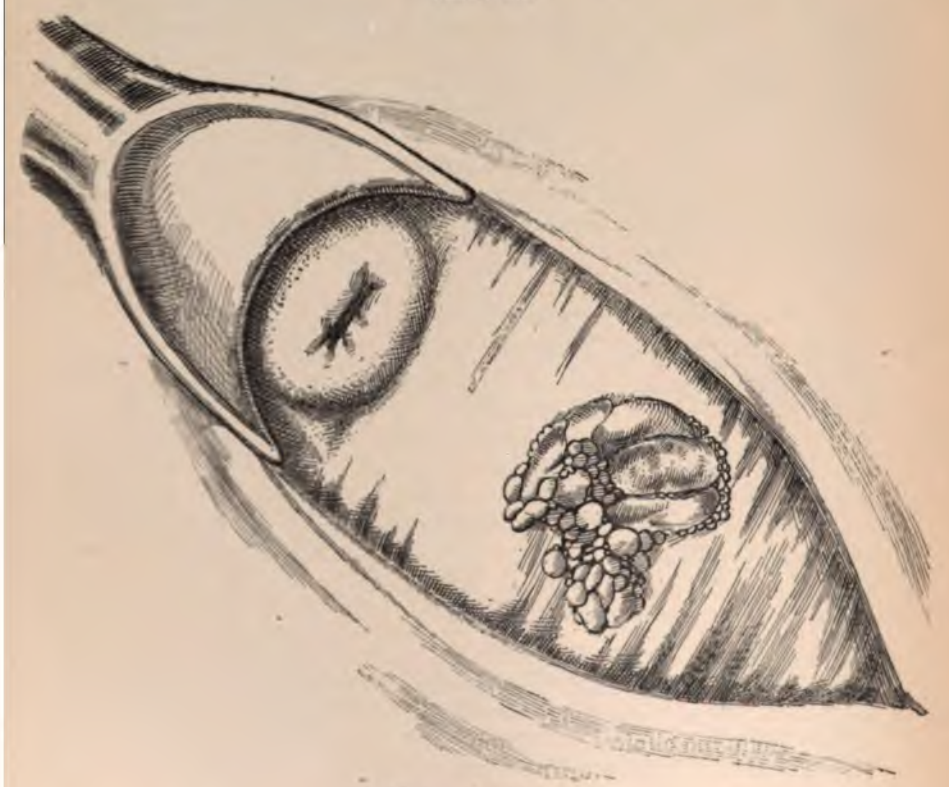
Cysts of the Vagina.

Vaginal cysts, although rare, are the most frequent of the tumors originating in the vagina ; they are probably from : 1, the embryonal remains of Gärtner's ducts ; or, 2, from the remains of the Wolffian

[1] Sutton. Tumors, Innocent and Malignant.

ducts; or, 3, from Müller's ducts. An echinococcus cyst[1] has been reported. Embryonal vaginal cysts are usually not larger than a walnut, although Veit has reported one as large as a fœtal head.[2] They are circumscribed, tense, elastic, rarely pedunculated, and commonly unilocular; they occur singly, or, in rare instances, are arranged in groups of two, three, or four in a row. The cyst-wall is composed of fibrous tissue, with an inner lining of cylindrical or pavement epithelium and an outer covering of vaginal mucous

FIGURE 199.



Carcinoma of vaginal wall.

membrane. The contents are commonly viscid, transparent, and of a pale-yellow color. The occasional chocolate color is explained by the presence of blood, pus, and epithelial cells.

The differential diagnosis is from cystocele, rectocele, emphysematous vaginitis, and vaginal hernia. Cystocele is demonstrated or excluded by the sound in the bladder and the finger in the vagina; rectocele by one finger in the rectum and another in the vagina. The cysts of emphysematous vaginitis contain gas, are usually multiple,

[1] Arch. de Tocologie, 1884, p. 193. Pozzi. Medical and Surgical Gynecology.
[2] Medical and Surgical Gynecology.

and do not follow the course of Gärtner's ducts. The hernial tumor temporarily disappears on pressure and gives an impulse on coughing.

If the cyst is within easy reach, the treatment is excision; if it is very close to the rectum, bladder, or ureters, the vaginal side should be removed, the remainder curetted or cauterized, and the wound packed with gauze.

Fibromyomata of the Vagina.

These tumors differ in no essential point from similar growths of the vulva and uterus. They are of rare occurrence, and usually small, but sometimes are large enough to give the mechanical symptoms of pressure and weight. The treatment is enucleation.

Carcinoma and Sarcoma of the Vagina.

Carcinoma of the vagina usually occurs by extension from primary carcinoma of the cervix, uterus, or rectum; it seldom originates in the vagina. Sarcoma of the vagina is almost unknown. The treatment—early excision—gives most unsatisfactory results.

CHAPTER XXVI.

TUMORS OF THE UTERUS.

MYOMA.

Etiology, Histology and Histogenesis, Classification, Symptoms, Diagnosis, Differential Diagnosis, Prognosis.

UTERINE myoma, like the uterus, is composed of fibrous connective tissue and non-striated muscle fibres. It is the most common and one of the most important of all uterine tumors.

Etiology.

The causes of myomata are not definitely known. These tumors commonly develop during the period of sexual maturity, rarely, if ever, before puberty or after the menopause. They are more frequent in the negro than in the white race, and, judging from the standpoint of family history, would suggest heredity as a strong etiological factor. The assertion occasionally appears in the older literature, that *traumatism is a possible cause*, but no evidence has ever been brought forward in support of such a claim. The assertion therefore is purely speculative.

Pathological Anatomy. The tumor is usually sharply circumscribed, single or multiple, hard or soft, of pinkish or whitish color, commonly of slow growth, and in size varies within the widest possible limits. On cross-section the gross appearance is glistening and may be homogeneous, but more usually the cut surface is striated with dense fibrous septa which divide the section into lobules. The spaces between the septa are filled with muscle fibres. See Figures 200 and 205. In later development a loose, fibrous capsule is formed which sharply defines the growth from its surroundings.

The bloodvessels of the fibrous capsule penetrate through the septa to the muscle cells. These growths are occasionally subject to extensive venous obstruction and to consequent dilatation of their veins. This often leads to the formation of cavernous spaces; hence the blood-supply, not only in different tumors, but at different times in the same tumor, is subject to great variation. This changeable blood-supply accounts for corresponding variation from time to time in the size of a tumor. Hard white tumors of a slow growth, containing a relatively large amount of fibrous tissue, are apt to have a limited blood-supply. On the other hand, the soft pinkish tumor of more rapid growth, with a relative preponderance of muscle cells, is always more vascular.

Histology and Histogenesis of Myoma.

The characteristic cell elements are non-striated fusiform muscle fibres with elongated nuclei. These fibres cross one another in all directions; hence the bloodvessels cannot, as in the myometrium, run parallel with the muscle fibres, but necessarily cross them at all angles. These vessels are therefore specially liable to constriction from the contractile muscle fibres. This arrangement is so unfavorable to nutrition that in some tumors the muscular elements either undergo atrophy or fall short of full development. The fibrous element, on the other hand, being nearer to the ultimate blood-supply and being more prolific, may increase disproportionately. This partly explains the great variation in the relative quantity of muscular and fibrous tissue—a variation which ranges from a tumor composed almost wholly of muscle fibres to one entirely composed of fibrous tissue. The latter growth is usually called a fibroma.

Nothing is known of the histogenesis of these tumors save their origin in the myoblast. This source, regardless of secondary changes which may modify the relative quantity of the muscular and connective tissue, stamps them as myomata. Terms like leiomyoma, fibromyoma, and fibroma should be used only to designate special characteristics. The tumor does not lose its identity as a myoma even though its muscular elements have been replaced by fibrous tissue.

Leiomyoma, Fibromyoma, and Fibroma. The soft vascular tumor described in a foregoing paragraph, because it contains a large amount of muscular tissue, has been called a *leiomyoma*. The hard, more fibrous myoma is often called a *fibromyoma* or a *fibroma*. There is no definite line between the so-called leiomyoma and fibromyoma.

FIGURE 200.

× 220

Structure of a myoma. Wavy bands of long spindle-cells with rod-shaped nuclei. At one point some cells are divided transversely. Magnified.[1]

The terms are relative and, to an extent, arbitrary, and to be used only for convenience of description.

[1] American System of Gynecology.

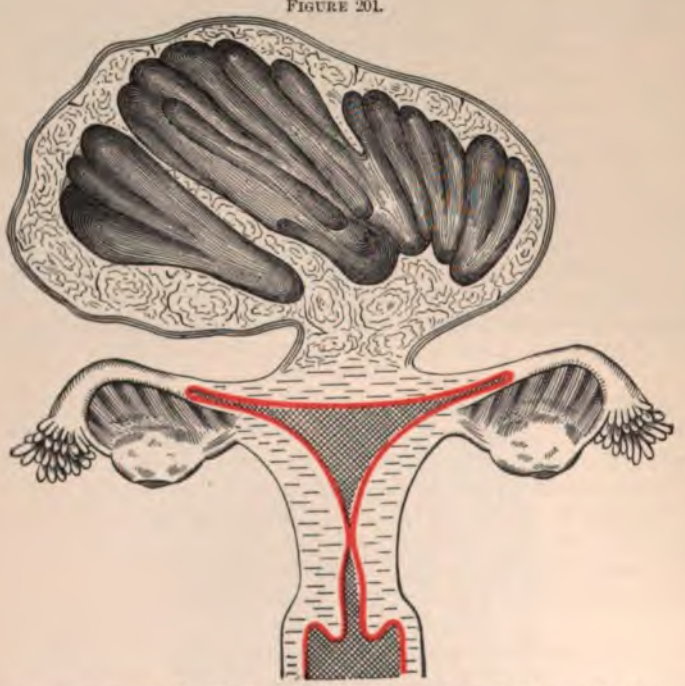
Secondary Changes of Myoma.

The secondary changes common to uterine myomata are as follows:

Fatty degeneration.	Calcification.
Mucoid degeneration.	Septic infection.
Cystic degeneration.	Malignant changes.

Fatty Degeneration pertains to the muscle fibres, and may result in their complete destruction. The blood-supply may then in a measure be crushed out by the contraction and solidification of the fibrous connective tissue; the tumor, thus deprived of nutrition, will shrink to a very hard, small, rudimentary mass. This process may be local or general; it is specially liable to occur in rather small tumors as a part of the atrophic changes of the menopause[1]; hence numerous spontaneous cures at this period.

FIGURE 201.



Fibrocystic myoma uteri. The interior of the tumor shows the fibrocystic changes.

Mucoid Degeneration is prone to occur in large fibromyomata. The fibrous tissue is converted to a mucin substance resembling the vitreous humor of the eye. The conversion of the tissue substance to mucin is preceded by œdema and by rapid increase in the size of the myoma. Sections of the tumor which form the boundary of the softened spaces show every gradation from fusiform cells to those of the irregularly branched, spider-like shape to which the term *myxoma* has been given. The process may result in the formation of numerous small cysts, or the tumor may be converted into a large spurious cyst

[1] American System of Gynecology.

having for its wall the fibrous capsule of the original myoma. This is called a *fibrocystic tumor*.[1]

Cystic Degeneration. Œdema may cause so much dilatation of the lymph-spaces as to give the whole tumor an appearance of marked cystic degeneration. The dilated cavernous veins already described may be converted into blood-cysts.

Calcification occurs most frequently in subperitoneal tumors, both large and small. The process may be general or local, and may pertain to the fibrous septa or to the capsule. Exceptionally the entire tumor is displaced by lime salts and converted into a stone—so-called womb-stone. A section of such a stone made by the saw will sometimes take a high polish. The whole arrangement of the fibrous septa and capsule will then appear reproduced in the lime salts and will identify the tumor. More commonly the spaces between the septa do not calcify, but disappear by some other degenerative process. This gives the calcified part a porous, worm-eaten appearance, or coral-like form. When the calcification is chiefly or wholly in the fibrous capsule the tumor is covered by a thin, hard crust which may closely resemble the fœtal skull. In the enucleation of such a tumor from the corpus uteri the writer once found a calcified capsule which, through the overlying peritoneal and subperitoneal structures, felt so much like a fœtal head—sutures, fontanelles, and all—that for fear of pregnancy he was almost led to abandon the operation.[2]

Septic Infection. A myoma which has for years given rise to no inconvenience may suddenly become infected. This will cause rapid increase in size, high pulse and temperature, great pain, and other evidences of septicæmia. The mode of infection, sometimes obscure, is usually explained by the presence of one or more of the usual causes of pelvic inflammation. The electrode and the unclean intrauterine sound are potent causes. External violence often precedes the infection. Oöphorectomy performed for the purpose of anticipating the menopause, osmosis of fluid and gas from an adherent intestine or bladder, are possible sources of infection. A fatal result is almost inevitable unless the diagnosis is made early and the tumor removed.[3]

Malignant Changes due to carcinoma and sarcoma will be considered under those subjects, Chapters XXVIII. and XXIX.

Classification of Myoma.

Location. The tumor may be anywhere in the uterine substance, but in the majority of cases it is in the body of the uterus. Tumors of the cervix uteri are apt to be small, those of the corpus larger.

The following classification is from the regional standpoint:

Intramural (interstitial) myomata.	Subperitoneal myomata.
Submucous myomata.	Cervical myomata.

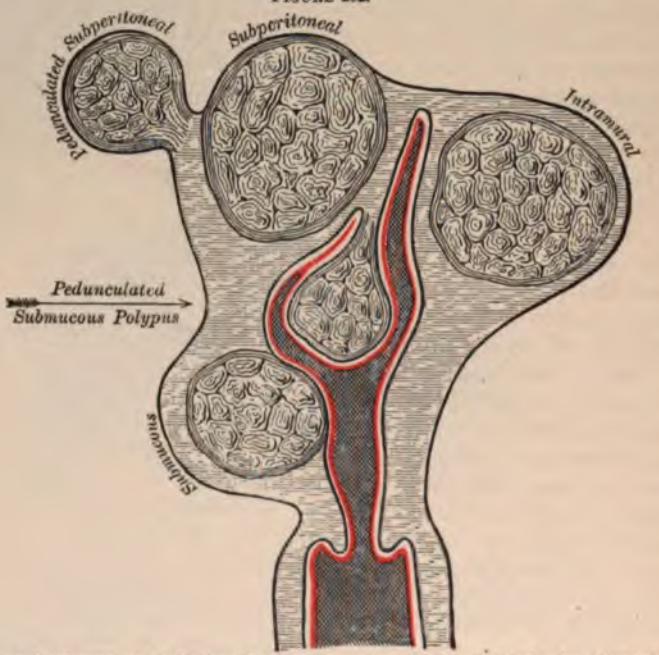
[1] Bland Sutton. Tumors, Innocent and Malignant.

[2] This tumor occurred in the practice of Gourley, Downer's Grove, Illinois. The case was reported in the American Gynecological and Obstetrical Journal, 1896.

[3] Bland Sutton. Tumors, Innocent and Malignant.

Intramural Myomata. All myomata are primarily intra-mural—*i. e.*, they all originate in the musculature. Any neoplasm situated in the muscular wall of the uterus—that is, in the myometrium—is an intramural tumor. It may be anywhere between the mucous lining and the serous covering. A growth, which to external examination appears to be one tumor, may on section prove to be a group of distinct tumors, each having its own capsule. The intramural tumor is

FIGURE 202.



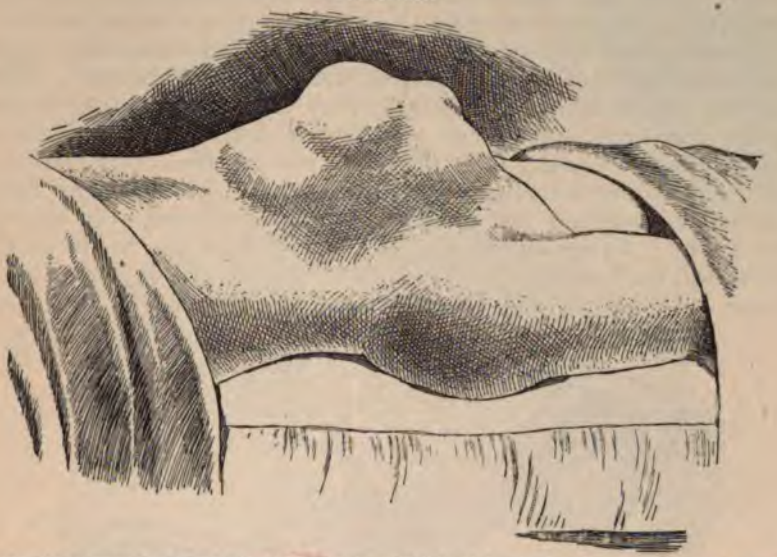
Intramural, submucous, and subperitoneal myomata. A pedunculated subperitoneal myoma is sometimes wrongly called extra-uterine myoma. A pedunculated submucous myoma is called intra-uterine polypus.

wholly surrounded by the muscular wall[1] of the uterus; this accounts for the greater blood-supply and more rapid growth. The growth is usually firm, sharply defined, and encapsulated; but may be soft, ill-defined, and without a definite capsule. The tumor will always irritate the surrounding muscular tissues, and cause them to contract upon it. If it is nearer to the endometrium than to the peritoneum, the preponderance of muscular tissue on the peritoneal side will slowly force it toward the interior of the uterus and tend to make of it a submucous tumor. If the preponderance of muscular tissue is between the tumor and the endometrium, the direction of least resistance will be toward the peritoneum, and the growth will tend to become subperitoneal. *Intramural is synonymous with interstitial.*

Submucous Myomata may originate in the muscular tissue of the mucosa, and be, therefore, primarily submucous; or an intramural tumor may, as explained in the foregoing paragraph, become secondarily submucous. The secondarily submucous tumor is apt to remain

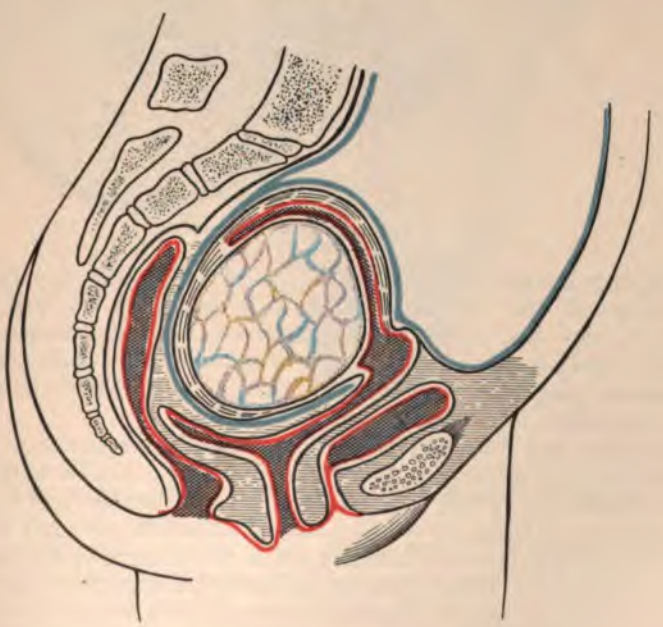
[1] Sutton. Tumors, Innocent and Benign.

FIGURE 203.



Shape of abdomen made by multiple myomata with thin abdominal walls. A malignant growth might give a similar external appearance.

FIGURE 204.



Submucous myoma.

sessile—*i. e.*, it has little tendency to the formation of a pedicle. The primarily submucous tumor, on the contrary, always has a pedicle.

Pedunculated Myomata are vascular, soft, and commonly single. They originate usually in the corpus, rarely in the cervix uteri. They vary in size within wide limits, and by their presence the uterine cavity may sometimes become enormously distended. Uterine contraction, moreover, may force the tumor through the cervix uteri into the vagina, and sometimes the pedicle, by this downward force, becomes so elongated that the extruding mass is forced even through the vulva. Inversion of the uterus is a possible result of the downward traction upon the fundus uteri of the extruding submucous tumor. The pedicle may be constricted by pressure of the cervical

FIGURE 205.

An intraligamentous myoma uteri.

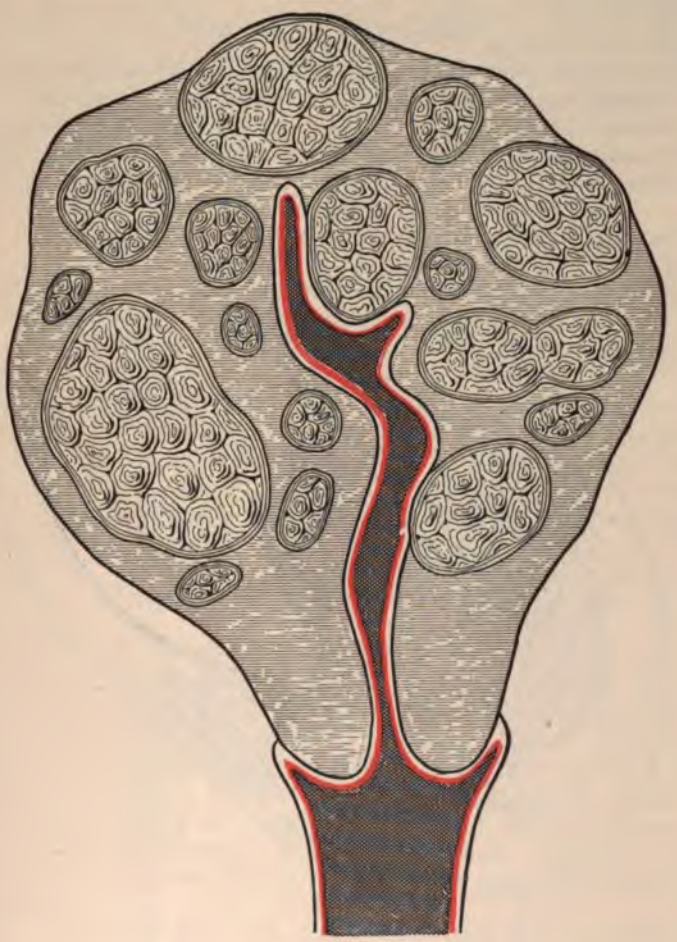
canal or may become twisted. This would cause œdema, and might, by cutting off the circulation, result in gangrene of the tumor. Gangrene may be followed by spontaneous and detachment cure. Usually, however, the extruded mass remains, and, in consequence of the œdema, gangrene or prolonged uterine hemorrhage becomes a menace to health or a destroyer of life.

Adhesions may form between an intra-uterine tumor and the endometrium or cervical mucosa, and cause partial or complete obliteration of the uterine cavity and lock the secretions within the uterus.

Subperitoneal Myomata—sometimes called subserous—may be either single or multiple, and occasionally reach the enormous size of forty or fifty pounds. These tumors, primarily intramural, have been forced outward by uterine contractions until they become secondarily subserous. Such a tumor may work its way some distance from the point of origin into the territory between the folds of the broad

ligament, and become an intraligamentous myoma.[1] A pedunculated subserous tumor may, in rare cases, become detached from the uterus and remain as a migrating tumor, free and harmless in the abdominal cavity; or may receive its nutrition through new adhesions which have formed between it and some of the pelvic or abdominal viscera;

FIGURE 206.



Multiple myomata.

or may become gangrenous and give rise to serious infection; or may atrophy and disappear.

Myomata of the Cervix Uteri are of rather infrequent occurrence. They follow the same law as to development and location as myomata of the body of the uterus. Subserous growths may spring from the supravaginal portion of the cervix. Myomata rarely appear on the

[1] Delafield and Prudden. Pathological Anatomy and Histology.

vaginal portion. A submucous cervical myoma is usually pedunculated. It may have the appearance of a uterus inverted into the vagina. See Inversion of the Uterus. An interstitial (*i. e.*, intramural) cervical myoma causes a thickening of the cervical wall around it, and by pressure and stretching a corresponding thinning of the opposite wall.

Symptoms of Myoma.

The symptoms may be described under the following heads:

Hemorrhage.	Congestion.
Pain and discomfort.	
Pressure and traction.	
Miscellaneous symptoms.	

Hemorrhage, the most important and the most pronounced symptom, begins *not* as a sudden, profuse flow, as in carcinoma, but as a

FIGURE 207.

Submucous polypoid myoma resembling an inverted uterus.

gradual increase in menstruation; the bleeding occurs frequently, is prolonged, and from ordinary conditions, such as exercise or coitus, is easily excited. The irritating presence of the tumor sets up a hemorrhagic endometritis, the hemorrhagic area being the endometrium, not, as sometimes supposed, the tumor itself. Nor is the hemorrhage specially confined to the mucous covering of the tumor. Fatal hem-

orrhage, however, has occurred from rupture of a bloodvessel in the growth.[1]

The degree of hemorrhage depends upon the location of the tumor relative to the endometrium and the peritoneum. The closer the relations to the uterine mucosa the greater the hemorrhage; the nearer to the peritoneum the less the hemorrhage; hence menorrhagia is almost invariable with the submucous variety, less severe but very common with the intramural, and usually slight or absent with the subperitoneal. The pedunculated submucous and the pedunculated subperitoneal myomata stand at the two extremes, the former producing the greatest hemorrhage, the latter none at all. The hemorrhage is not always proportionate to the size of the tumor; a large tumor may obstruct the flow of blood, or by pressure-atrophy of the endometrium may give rise to scanty menstruation; on the other hand, a small submucous myoma may cause alarming hemorrhage.

The presence of a myoma often delays, prolongs, or prevents the menopause. The tumor, however, may participate in the atrophic processes of this crisis, and become much smaller, or may even disappear. Sometimes the menopause has the opposite effect—*i. e.*, great and sudden increase of growth. This is a strong indication for myomectomy or hysterectomy.

Pressure and Traction cause numerous mechanical and other disturbances of the rectum, bladder, ureters, urethra, and of the uterus itself. Among these are hemorrhoids, constipation, rectal and vesical tenesmus, mucous diarrhœa, frequent urination, dysuria, retention of urine, and uterine displacements. Pressure upon the venous trunks often causes great dilatation of the veins and passive congestion throughout the pelvis. This necessarily impairs the nutrition of the pelvic organs. Occlusion of a ureter by pressure has caused hydronephrosis.[2]

A myoma in the anterior uterine wall, even though small, may, by pressure, cause extreme vesical irritation, and may even be a cause of cystitis. Suppression of urine from pressure or traction, especially if an unclean catheter be used, is another cause of cystitis. Frequently a myoma becomes incarcerated under the promontory of the sacrum and continues to grow there. The pressure-symptoms, unless the tumor is spontaneously or manually forced up into the abdominal cavity, will then be intense. In such a case there will be great pain and interference with functions not only in the pelvis, but also in the thighs and legs.

Uterine displacements may result from pressure, traction, and increased weight. A tumor situated above, below, to either side, in front, or back of the uterus may force it in the opposite direction, or may draw it by traction in the same direction, or, by increasing the weight of the uterus, may cause prolapse. A myoma, for example, which has grown too large for the pelvis to hold it, and has therefore risen into the abdomen, will cause by traction upward displacement.

The Pain and Discomfort incident to this affection have been

[1] Duncan. Edinburgh Medical Journal, 1867. Pozzi.
[2] Murphy. London Journal of Medicine, October, 1849. From Pozzi.

partially described in the foregoing paragraphs under Pressure and Traction. Backache, bearing-down, dragging sensations in the pelvis, and painful uterine contractions are familiar subjective symptoms. Expulsive contractions of the uterus upon a mural or submucous myoma, especially during the period of menstrual congestion and irritation, may be transient or constant, moderate or severe.

Miscellaneous Symptoms. Intermenstrual uterine discharges usually occur in the progress of the disease. They may be purulent or serous, or both; they are commonly mixed with blood, and are often profuse and exhausting. The watery discharge—hydrorrhœa—so commonly associated with malignant disease is very infrequent; when present it is more transient and less offensive than in cancer or sarcoma. Dysmenorrhœa is common.

Diagnosis of Myoma.

Uterine myomata, unless very small and associated with metritis, are usually not difficult to recognize. The symptoms outlined in the foregoing paragraphs, although diagnostic, are far from pathognomonic. The diagnosis will always depend upon the physical signs—that is, upon inspection, palpation, conjoined examination, and exploration of the uterine cavity. See Chapter III., on Diagnosis.

Inspection and Palpation will show enlargement of the abdomen, unless the tumor is too small to produce that result. External palpation, if the tumor is large, discloses in the pelvis and lower abdomen a solid, usually hard, though sometimes soft mass. Exceptionally, the growth has a peculiar elasticity which resembles fluctuation, but lacks the percussion-wave peculiar to cystic tumors. The tumor may be single and symmetrical, globular, or oblong. The presence of multiple myomata may, with their numerous projections, give to the uterus a most irregular form. Many small tumors may be distributed so evenly throughout the uterine walls as to cause a nearly symmetrical enlargement of the uterus. In such a case, however, the surface usually gives to the touch a sensation of small nodular irregularities. Inspection, palpation, and percussion will be further considered in connection with the differential diagnosis.

Conjoined Examination. The index or the index and middle fingers in the vagina, the palmar surface directed toward the uterus and tumor, and the palpating finger of the right hand over the abdomen, will, if the abdominal muscles are not too tense, enable the operator to outline the uterus and its myomatous projections. In the majority of cases ordinary conjoined examination will complete the diagnosis. The palpation is often much facilitated by means of the thumb in the vagina and the index-finger in the rectum. This enables the operator to pick up, so to speak, the enlarged uterus between the thumb and finger. Information through the examining finger is obtained not so much by forcing it up against the tumor as by strong pressure of the tumor against it by means of the right hand over the abdomen. If the abdominal walls are rigid or thick, anæsthesia may be necessary.

Intra-uterine Exploration is made by the finger, the sound, or the curette. Digital exploration of the interior of the uterus is possible only when the uterine canal is dilated. The dilatation may be brought about by instrumental means or by expulsive uterine contractions upon an intra-uterine tumor, which may have the effect of forcing it out. The index-finger in the dilated uterus will recognize by direct touch the presence and character of an intra-uterine myoma, and may materially aid in its removal.

The Sound and Curette. *The one physical sign constant for all uterine myomata is elongation of the uterine cavity.* The increased length is proportionate to the size of the tumor, and may reach seven or more inches. The sound is often necessary to measure this length. A submucous tumor may, unless great care is used, obstruct the passage of the sound and lead to a wrong measurement. Submucous and intramural tumors project into the uterine cavity, and thereby render the uterine canal tortuous. Hence the sound or probe will be deflected, and as it glides over the growth the deflection will indicate the size of the growth, the degree to which it projects into the uterine cavity, and the depth of the uterus. The tumor may be too soft or small to be recognized by the sound.

The sound will show:

1. Direction of uterine canal
2. Length of uterine canal.
3. Shape of uterine cavity.
4. Relations of tumors to uterine cavity.

Differential Diagnosis.

The principal lesions from which myoma must be differentiated are the following:

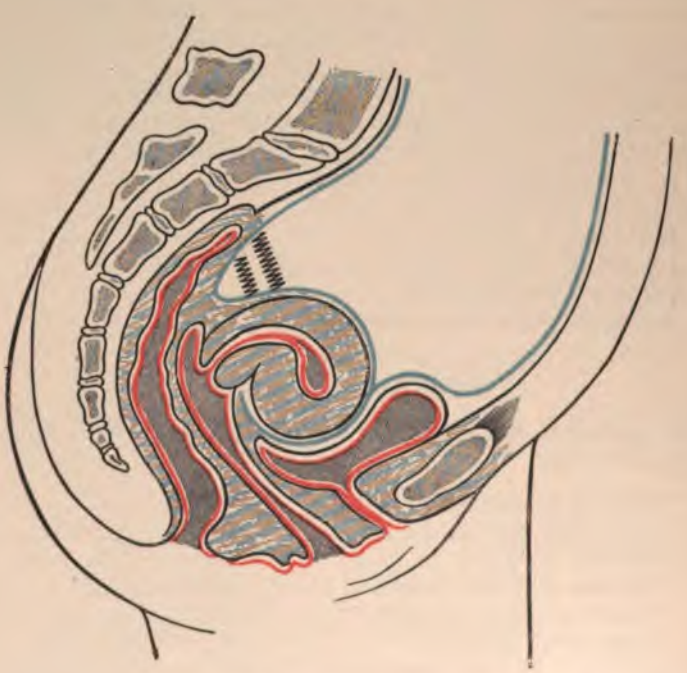
Normal pregnancy.	Ovary.
Carcinoma and sarcoma.	Pelvic infiltrations.
Chronic metritis.	Pelvic cysts.
Inversion of the uterus.	Sactosalpinx.
Uterine displacements.	Tubal pregnancy.
Incomplete abortion.	Floating kidney.

Pregnancy. Normal utero-gestation will be excluded by the absence of the usual signs of pregnancy. The difficulties in diagnosis will commonly arise in abnormal pregnancies, especially in placenta prævia and in pseudo-menstruation connected with pregnancy. If the enlargement of the uterus be symmetrical and the rate of growth usual for a pregnant uterus, and the os be soft and patulous, pregnancy is highly probable. If, on the other hand, the cervix be hard, the os non-patulous, and the uterus irregular in outline from the presence of a hard, resisting mass, the diagnosis is probably myoma. Not very infrequently myoma and pregnancy coexist; then if the tumor is large and the fœtus is small, the difficulty of diagnosis is great. In doubtful cases, the myoma, if present, will under observation declare itself by relatively slow growth. The following tabular statement contains the chief points of difference between myoma and pregnancy.

PREGNANCY.	MYOMA.
1. History of pregnancy.	1. Absent.
2. Uterus soft and elastic.	2. Usually irregular in form and harder.
3. Consistency varies with uterine contractions.	3. Usually not so—very important sign.
4. Cervix soft.	4. Hard or not so soft.
5. Regular and uniform increase in size of uterus.	5. Growth slower and irregular.
6. Later, ballottement, fœtal heart-tones.	6. Absent.
7. Palpation of fœtus.	7. Palpation of myoma.

Diagnosis of Myoma complicating Pregnancy. Myoma may be mistaken for the fœtal head, elbow, or knee. Intramural myoma

FIGURE 208.



Anteflexion of the uterus simulating myoma.

complicated by pregnancy takes on rapid increase of growth, is softer than formerly, but firmer than the pregnant uterus; this variability in consistency is almost proof of complicating pregnancy, and should be the object of repeated examinations. Later, one may palpate the fœtus, elicit ballottement, and hear the fœtal beat.

Carcinoma and Sarcoma. The evidences of malignant disease, including the sudden onset of hydrorrhœa, the bloody, fetid discharge, the rapid emaciation, and the microscopic finding of carcinoma or sarcoma in the scrapings, will definitely exclude myoma. A slough-

ing, extruding myoma may, however, both in the profuse fetid discharge and in the sensation to the examiner on touch, closely resemble carcinoma or sarcoma of the cervix. The diagnosis then will depend on the microscope.

Metritis often complicates uterine myomata, and is difficult, often impossible, to differentiate from small, multiple, interstitial growths.

FIGURE 209.

Myoma complicated by pregnancy. Complete hysteromyomectomy; recovery.[1]

The symmetrical form of the uterus is the distinguishing feature of metritis. See differential tabular statement below.

CHRONIC METRITIS.	MYOMA.
1. Uniform enlargement.	1. Enlargement usually irregular.
2. Uniform hardness.	2. Uterus softer than tumor.
3. Uterus not larger than two or three times the normal size.	3. Size may increase to thirty or forty pounds.

[1] Operation at St. Luke's Hospital, Chicago.

If the tubal pregnancy has resulted in pelvic hæmatocele by tubal rupture or tubal abortion, the differential points will be as follows :

HÆMATOCELE.	MYOMA.
1. History of tubal pregnancy.	1. Absent.
2. Sudden appearance, shock, severe pain, and evidence of hemorrhage.	2. Absent.
3. Consistence of mass usually soft, later hard.	3. Usually hard.
4. Not sharply outlined.	4. Sharply outlined.
5. Later, mass shrinks and becomes harder or may suppurate.	5. Commonly increases in size; may decrease after menopause.

Inversion of the Uterus. A uterine myoma protruding into the vagina may have the appearance of an inverted uterus. The sound

FIGURE 210.

Myoma simulating anteflexion of the uterus.

will then glide past the tumor into the uterus above. Conjoined recto-abdominal examination will demonstrate the absence of the uterus in its normal location if it be inverted into the vagina. See Inversion of the Uterus. See Figure 182.

Displacements of the Uterus are recognized on conjoined examination by the symmetrical contour of the uterus and by the change in the direction of the uterine canal as demonstrated by the sound.

Incomplete Abortion with hemorrhage will be recognized by the history of the interrupted pregnancy and by microscopic examination of the scrapings.

The Ovary, especially if adherent to the uterus, sometimes simu-

lates a small pedunculated subserous myoma. The myoma, however, is smoother, more firm, and less sensitive to pressure.

Pelvic Inflammatory Infiltrations, unlike myomata, always give a history of pelvic inflammation, are very tender on pressure, immobile, and prone to disappear by resolution or to undergo suppuration. See differential diagnosis of Pelvic Cellulitis, Chapter XX.

Pelvic Cysts are distinguished from myomata by fluctuation, by separability from the uterus on palpation, by more rapid growth, by the normal or nearly normal length of the uterine cavity, and by the absence of uterine hemorrhage.

Sactosalpinx develops more rapidly, is commonly situated at the side of the uterus, is of elongated, ovoid form, is fluctuating, is more or less tender on pressure, and does not cause material enlargement of the uterine cavity.

Tubal Pregnancy gives a history of gestation. The gestation-sac closely resembles sactosalpinx. Rupture of the tube produces pelvic hæmatocele. A decidua may be cast out of the uterus. The reader is referred to the clinical forms of endometritis, Chapter XVII.

Floating Kidney, unless adherent, is readily replaced; it has the form of a kidney, and may be tender on pressure. See Displacement of the Kidney, Chapter XXXIII.

Non-operative Prognosis of Myoma.

Myoma may be present throughout the period of sexual activity and produce no subjective symptoms, or it may give rise to the symptoms already outlined. It may participate in senile atrophy of the reproductive organs at the menopause or in involution after pregnancy, and thus become much smaller or disappear. On the other hand, it may at either of these times grow larger. It usually develops rapidly during gestation. Even small growths, if near the endometrium, may threaten life from hemorrhage. Complicating cardiac and renal diseases render the prognosis more grave. The causes of death include hemorrhage, sepsis, peritonitis, and secondary changes in the tumor itself. The prognosis after operation will be given in the succeeding chapter.

Natural Cure. There are three natural modes of cure:

1. Great shrinkage or disappearance by absorption—rare; reason unknown.

2. Detachment of intra-uterine or intramural myoma and expulsion through the cervix uteri or vagina; detachment of subserous pedunculated myoma into the peritoneum. See Subperitoneal Myomata.

3. Disintegration and gangrene.

CHAPTER XXVII.

TUMORS OF THE UTERUS (CONTINUED).

TREATMENT OF MYOMA.

THE treatment includes medication, manipulations, intra-uterine tamponade, intra-uterine styptics, electrolysis, and surgical operations. The treatment is, therefore, non-surgical and surgical.

Non-surgical Treatment.

1. Medication.
2. Manipulations.
3. Intra-uterine tamponade.
4. Intra-uterine styptics.
5. Electrolysis.

1. Medication. Ergot stands at the head of the numerous drugs that have been used in the treatment of uterine myoma. Indeed, no other drug, save possibly hydrastis canadensis, has any special value. The latter is said to have some power to control hemorrhage. Neither of these drugs has any special value as a means of radical cure. Ergot has some value in controlling hemorrhage, and thereby preserving the vitality of the patient until relief may come with the menopause or with surgical removal. The drug, if long continued, is not well borne by the stomach; hence it should be given either by hypodermic injection or by rectal suppositories. The dose is determined by the effect. If used at all, sufficient should be given to control the bleeding. The ice-bag over the hypogastrium is a valuable aid to ergot.

2. Manipulations. Sometimes a myoma becomes incarcerated in the small pelvis. Two results may follow: first, serious pressure-symptoms; second, œdema of the tumor. The immediate indication is to force the tumor up into the abdomen. This is done by the finger or fingers of the left hand in the vagina or rectum. The knee-breast position is most favorable to this treatment. Anæsthesia may be necessary. In some cases the tumor is prone to fall into the pelvis minor and to cause great mechanical disturbances, so that daily replacement is necessary. If the tumor is not replaceable and pressure symptoms are urgent, the removal of it may be imperative.

3. Intra-uterine Tamponade. When hemorrhage is profuse and exhausting, the most effective means of temporary hæmostasis is by intra-uterine tamponade. Its application is best made through Sims' speculum with the patient in the left latero-prone position. See Chapter IV. In aggravated cases it is necessary to repeat the tampon

several times during menstruation. A continuous strip of aseptic gauze should be tightly packed into the uterus, especially into the cervical cavity. The packing should be removed every forty-eight hours until the flow has ceased. In this way an exhausted exsanguinated patient may in a few weeks regain strength to endure the radical operation. This treatment in the hands of the author has in one case been followed not only by entire relief of menorrhagia, but by the almost total disappearance of the tumor. The tampon was used during three consecutive menstruations, and the tumor was reduced from the size of a child's head to that of a hen's egg. The age of the patient, forty-five years, and the near approach of the menopause may partially, at least, account for the result.

4. Intra-uterine Styptics, such as Churchill's tincture of iodine, solution of iron persulphate, and the 10 per cent. solution of antipyrine, may be injected into the uterus for the control of hemorrhage. These agents, especially the iron persulphate, are apt to form hard blood-clots,which may become septic and therefore dangerous. The method is altogether inferior to that of tamponade.

5. Electrolysis. The observations of Vineberg[1] upon the statistics of Keith, Engelmann, Gautier, and other eminent electro-therapeutists, show three hundred and seventy-two cases with nine cures and five deaths—an excessive mortality when contrasted with the limited number of cures. Galvano-puncture and electrolysis in fibrocysts are strongly condemned. The earlier promises of the enthusiastic supporters of electrolysis have not been fulfilled; the immediate dangers of it also are considerable. The survival of the electrical method in gynecology depends chiefly upon the patient's ignorance of its inadequacy and dangers, upon her worship of the mysterious, upon an unreasoning dread of operative measures, and upon a desire to grasp any other promising means of relief.

Surgical Treatment.

It would be unprofitable to enlarge upon a great variety of procedures which have become or seem destined to become obsolete. The more useful operations for the treatment of fibromyomata of the uterus will be divided as follows:

1. Palliative operations.
2. Radical vaginal operations.
3. Radical abdominal operations.

1. Palliative Operations.

The palliative operations are: *a*. Curettage. *b*. Ligature of the uterine arteries and broad ligaments. *c*. Removal of the uterine appendages.

a. **Curettage.** The irritating presence of the tumor often gives rise to hemorrhagic endometritis. Curettage is therefore indicated precisely as it would be in hemorrhagic endometritis from any other

[1] American Text-book of Gynecology.

cause. The operation is generally followed by some relief from the menorrhagia, but is seldom permanent in its results, and must usually, therefore, be repeated again and again. It is especially useful in connection with intra-uterine gauze tamponade to control hemorrhage until an exhausted patient can gain blood and strength for a more radical operation, or, in cases of small tumors, until the menopause has passed. Curettage of the myomatous uterus gives increased danger of sepsis; hence the necessity for strict antiseptic care. For a description of curettage, see Chapter IV.

b. **Ligature of the Uterine Arteries and Broad Ligaments.** The purpose of these measures is to shut off the blood-supply to the uterus, and, by this means, to induce atrophy of the growth. Gottschalk, of Berlin, reports cases of multiple myoma in which he ligatured the uterine arteries with good results. Martin ligatures the whole base of the broad ligament so as to include not only the uterine artery, but its branches and certain uterine nerves. He even goes so far in desperate cases as to ligature also the ovarian artery on one side. Robinson reports successful cases in which he has ligatured the Fallopian tubes and broad ligaments, including the ovarian and uterine arteries on both sides. The method has hitherto failed to elicit much discussion. Even its authors of late preserve on the subject an ominous silence.

c. **Removal of the Uterine Appendages.** This procedure, which suggests the names of Battey, Hegar, and Tait, when properly carried out—*i. e.*, when the ligatures are placed close to the uterus so as to include a large part of the broad ligament—usually stops the hemorrhage and reduces the tumor, sometimes even causing it to disappear. Its dangers, however, are nearly if not quite as great as those of the more radical operations. This is especially true since the technique of the latter has now been perfected. Removal of the ovaries and Fallopian tubes for myomata is almost an obsolete operation; at most, it will be performed only in rare cases of small tumors in which, for some special reason, hysterectomy and myomectomy are undesirable.

2. Radical Vaginal Operations.

The vaginal operation is preferable when the tumor can be readily reached by that route. All cervical fibroids, all intra-uterine pedunculated fibroids, and some of the more accessible submucous fibroids, may usually be removed by way of the vagina. In their removal the scissors and galvano-cautery, so often used for hæmostasis, are unnecessary, because the hemorrhage is either not feared or can be controlled by the uterine tampon. The vaginal route has been reserved for tumors of a size not larger than the head of the small pelvis.

The vaginal operations are: *a.* Removal of small pedunculated myomata. *b.* Vaginal hysterectomy. *c.* Vaginal myomectomy.

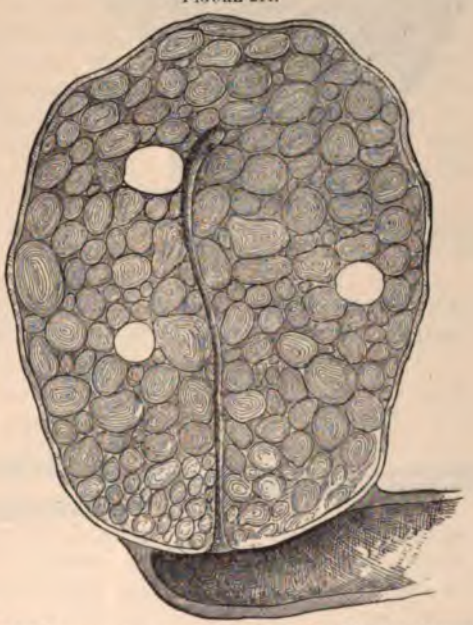
a. **Small Pedunculated Myomata.** When the pedicle by uterine contraction on the tumor or by in-

strumental means, the pedunculated tumor is seized by the vulsellum forceps or bullet forceps, drawn down, and removed by the scissors. The uterus is then packed with aseptic gauze.

b. **Vaginal Hysterectomy.** When numerous small tumors are scattered throughout the uterus, and the number is so large that individual enucleation is impossible, and when, moreover, the uterus is not too large to be delivered through the vagina, it may be removed entire by vaginal hysterectomy. The operation is the same as vaginal hysterectomy for carcinoma. See Chapter XXIII. Delivery through the vagina sometimes presents unexpected difficulties. The surgeon should therefore be prepared for a supplemental abdominal section.

c. **Vaginal Enucleation and Morcellation.** Intramural myomata, especially if situated in the lower segments of the corpus or in the cervix uteri, and not too large, may be safely enucleated and removed

FIGURE 211.



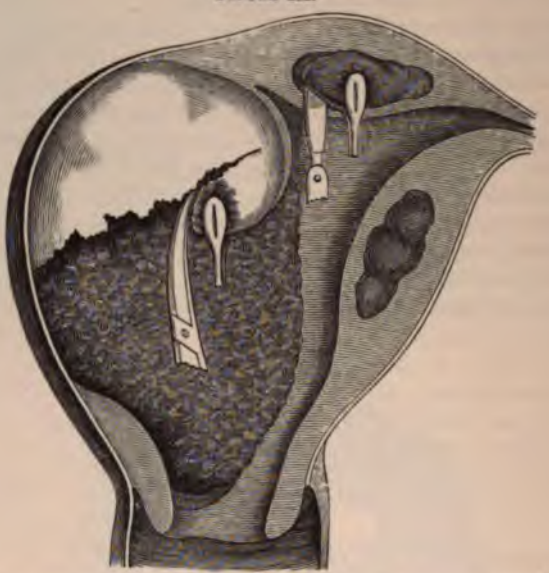
Multiple myoma case suitable for vaginal hysterectomy.[1]

through the vagina. The morcellation method has been often and successfully used by French surgeons for the removal of large intramural tumors. The removal is accomplished by repeatedly seizing the presenting part of the tumor with the vulsellum forceps and cutting away as large a piece as possible with the scissors, one piece after another, until the whole tumor has been removed. This is the operation by traction and morcellement or morcellation. The method, although generally supposed to be of more recent origin, was virtualiy described by Thomas Addis Emmet more than thirty years ago,

[1] Emmet. Principles and Practice of Gynecology.

and has been constantly advocated and practised by him ever since.

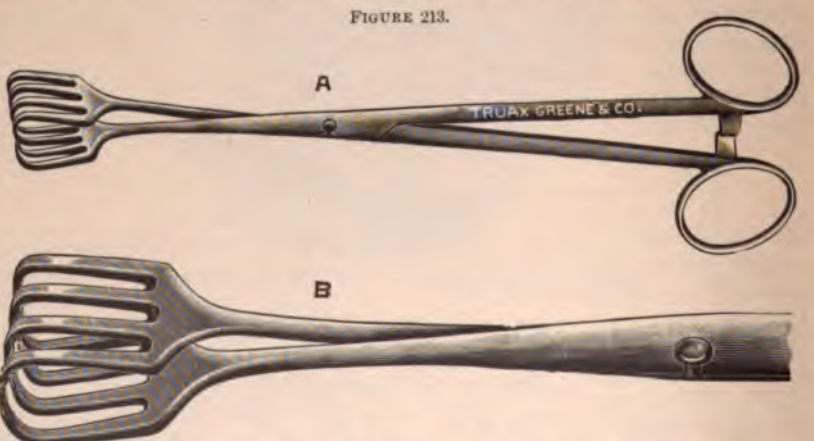
FIGURE 212.



Radical vaginal operation. Morcellation of an intra-uterine myoma. Scalpel not recommended.[1]

It is applicable to those cases in which the tumor is accessible through the vagina, but is too large to be enucleated and delivered entire.

FIGURE 213.



Vulsellum forceps for grasping tumor in the operations of vaginal or abdominal myomectomy. A. Reduced size. B. Section of full size.

The operation of traction and morcellation, when its technique is more generally understood and its advantages appreciated, will undoubtedly become more and more a procedure of election in place

[1] From Péan. Tumeurs de l'Abdomen et du Bassin.

of hysterectomy. Many large submucous or mural tumors, for which the abdomen is now opened and the uterus sacrificed, may be rapidly, safely, and effectually removed by this method.

One strong contraindication to the vaginal route must always be, however, the possible presence of pus tubes or ovarian abscesses, so often unrecognized or unrecognizable when they occur in connection with large, irregular fibromyomata. Oftentimes an unsuspected pus tube has been ruptured by the enucleation or morcellation of a myoma through the vagina. The vaginal route, then, should be avoided if there be reason to suspect purulent disease of the uterine appendages.

The tumor is usually made more accessible and enucleation or morcellation of it facilitated either by dilatation or, more frequently, by deep lateral incisions of the cervix, even to the internal os. These incisions having been made, the anterior and posterior lips of the cervix are drawn well down to the vulva and held widely apart by means of strong, double tooth forceps in the hands of an assistant. The operator then seizes the presenting part of the tumor with heavy Péan morcellation tooth forceps, and removes it, either by enucleation or by morcellation. If the tumor be of mural origin, it may be necessary to divide the mucous membrane and subjacent muscular tissue before commencing the enucleation. This incision should be parallel to the uterine canal.

The writer has made use of an improvement upon the two lateral incisions. It is a simple median incision through the anterior wall of the uterus and is made as follows:[1]

1. Make a circular incision in front of the uterus which shall separate the vaginal wall from the cervix at the utero-vaginal attachment, as shown in Figure 188.

2. Incise the anterior vaginal wall from the middle point of the first incision for a distance of about one inch, taking care not to invade the bladder and to avoid the ureters on either side. These incisions are the same as for anterior vaginal section, described in Chapter XXIII.

3. Separate the bladder from the uterus by means of the finger or some blunt instrument, keeping close to the uterus until the peritoneum is reached, but not divided. Then expose with retractors or fingers the anterior wall of the uterus. Figure 189.

4. Divide the anterior wall of the uterus longitudinally in the median line by means of scissors to whatever extent it may be necessary to render the tumor accessible. Figure 189. If necessary the peritoneum may be opened and the incision carried up into the corpus uteri.

This simple anterior incision permits wide separation of the lateral fragments of the anterior uterine wall, and thereby exposes the endometrium, and may render accessible a myoma in any part of the uterine wall. It has the following advantages over the lateral incisions: 1. There is less traumatism—one incision instead of two.

[1] Transactions Minnesota State Medical Society, 1896, published in the Journal of the American Medical Association, August 15, 1896.

2. The parametria are not opened and exposed to possible sepsis. 3. The tumor is more accessible, because the anterior uterine wall is

FIGURE 214.

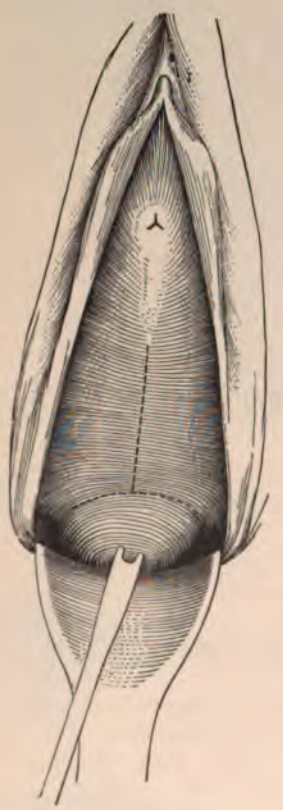


FIGURE 215.

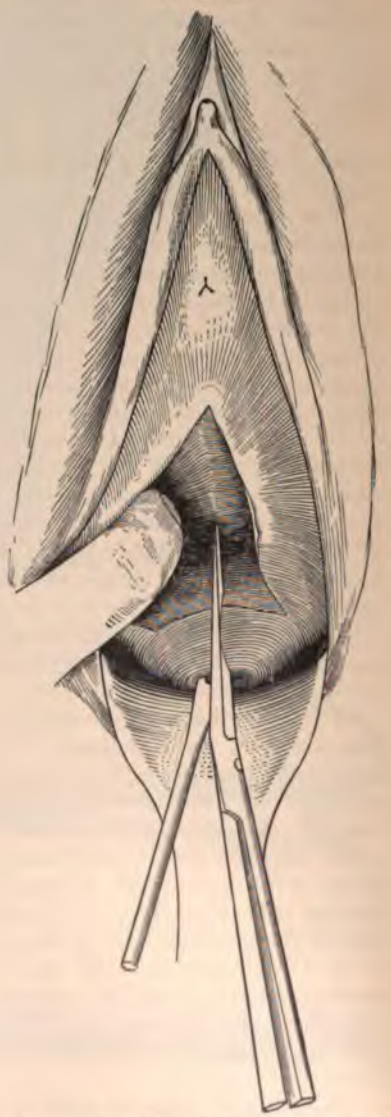


Figure 214.—Radical vaginal operation. Author's operation. Lines indicating the vaginal incisions to expose the anterior uterine wall preparatory to dividing it with scissors.

Figure 215.—Author's operation. Making longitudinal division of anterior wall of uterus, in order to expose the field of operation for the removal of a myoma.

out of the way, instead of being between the operator and the field of operation. 4. A much longer incision may be made, if neces-

sary, because the broad ligaments are not involved. 5. There is less hemorrhage. 6. The pelvic cavity may be easily reached through this incision for any further operation on the uterine appendages

FIGURE 216.

Flat vulsellum forceps. *A*. Reduced size. *B*. Section of full size.

or peritoneum. Even a small pedunculated subperitoneal tumor could be removed through this incision.

3. Radical Abdominal Operations.

Radical abdominal operations are adapted to large subperitoneal and intramural tumors which cannot well be removed through the vagina.

The relations of the tumor to the uterus and the surrounding conditions may determine its removal in one of three ways: 1. Certain myomata may be removed without sacrificing any part of the uterus. 2. All of the uterus, except the infravaginal portion of the cervix, may have to be removed with the tumor. 3. The entire uterus may have to be removed. The operations therefore are:

1. Myomectomy—the removal of the tumor without sacrificing any part of the uterus.

2. Supravaginal hystero-myomectomy—the removal of the tumor together with the corpus uteri and the supravaginal portion of the cervix uteri.

3. Complete hystero-myomectomy—the removal of the tumor and the entire uterus.

1. ABDOMINAL MYOMECTOMY.

Abdominal myomectomy—the removal of the tumor without sacrificing any part of the uterus—is indicated for:

a. Pedunculated subperitoneal tumors. Figure 217.

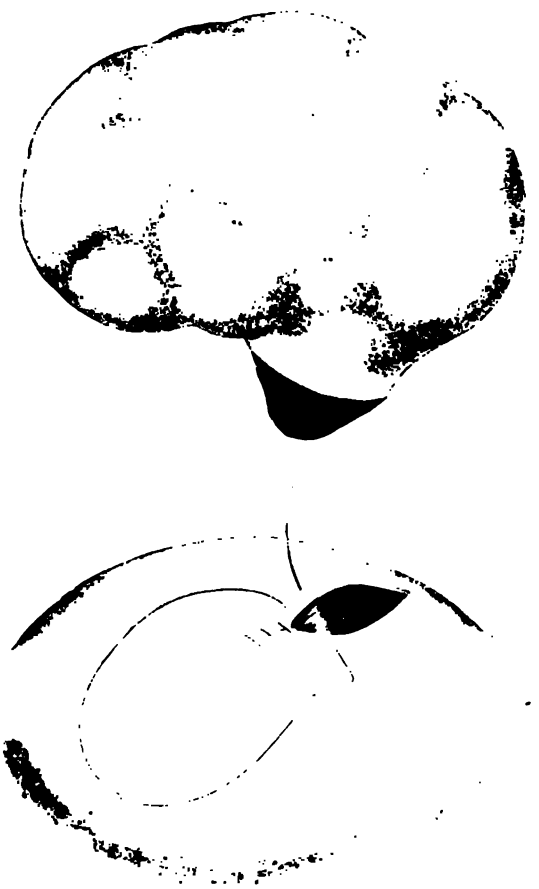
b. Small intramural and subserous tumors, when the growths can

be removed with slight traumatism and the uterine wound closed with interrupted or continuous catgut sutures. Figures 218 and 219.

c. Some large intramural and subserous tumors which can be readily enucleated—shelled out—and the uterine wounds closed with or without drain. Figures 220 and 221.

The growths indicated under *a* and *b* may easily and safely be treated by enucleation and suture.

FIGURE 217.

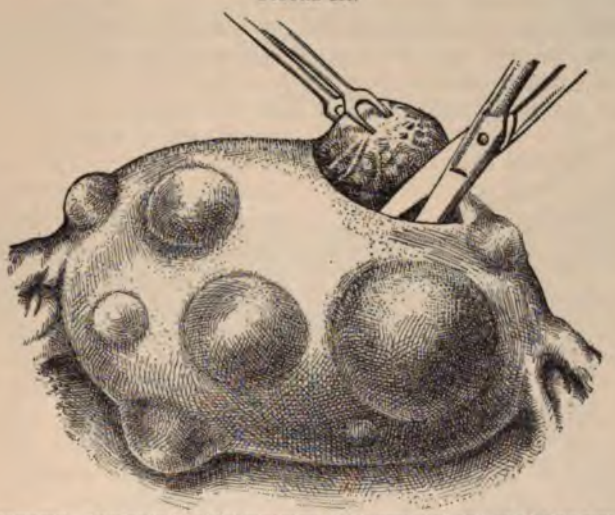


Myomectomy. Pedunculated myoma removed; wound being closed by continuous catgut suture.

The larger growths indicated under *c*, even though lying deep in the uterine wall or broad ligament, may in many cases be "shelled out" with the greatest ease, and the tumor cavities from which they have been removed may be successfully closed and obliterated by buried sutures; or, if the surfaces are too extensive to be treated safely by buried sutures, the cavities may be drained, and in this way

finally obliterated. Figures 220 and 221 show the method of drainage and suture. While a large growth is being enucleated and the uterine wound closed hemorrhage may be controlled by a temporary

FIGURE 218.



Myomectomy. Uterus with eight myomata to be removed and one being removed.

rubber ligature placed around the lower segment of the uterus Before closing the abdominal wound this ligature is removed, and a little time is allowed to make sure that there is to be no hemorrhage from

FIGURE 219.

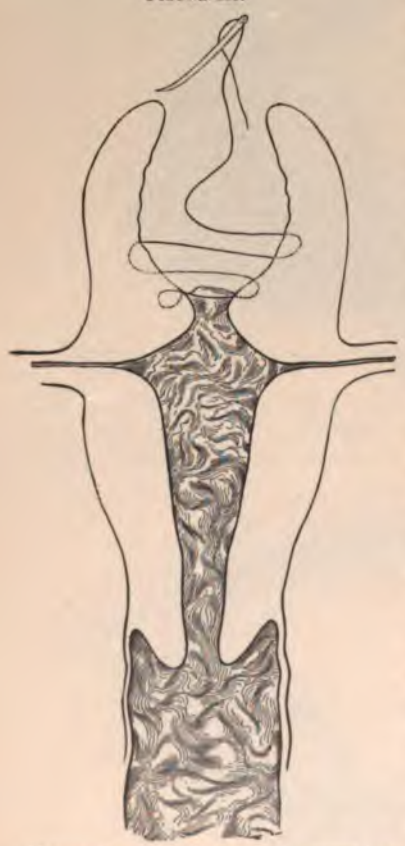
Myomectomy. Same uterus as shown in Figure 218. Shows method of closing wounds made by removal of myomata; continuous catgut sutures.

the uterine wound. Hemorrhage is usually in great measure controlled by the uterine contraction which follows the enucleation. The mortality of this method for small tumors, in which the traumatism is slight, is surprisingly small.

In case of a large tumor, and consequently of large traumatism with enormous surfaces to be united by buried sutures, the method involves too great danger of sepsis and secondary hemorrhage, and should either give way to hysteromyomectomy or be modified as follows:

After the tumor has been shelled out from the uterine wall an opening is made directly from the tumor cavity to the uterine cavity. If the uterine canal is patulous, a continuous strip of gauze is carried from the tumor cavity directly through into the vagina, the tumor cavity being packed with the same continuous strip. The temporary elastic ligature around the uterus does not interfere with the introduction of the gauze. The uterine wound is then closed, as above described, by buried sutures of catgut. The peritoneal margins of this wound are turned in and united, as shown in Figure 220; the whole uterine traumatism, now isolated from the peritoneum, is adequately drained through the vagina. If the uterine canal is not sufficiently patulous to admit the gauze, it may be dilated or bilaterally incised by means of a herniotomy knife, or it may be both dilated and incised. The vagina is loosely filled with gauze to meet that which protrudes from the uterus; an absorbent vulvar dressing, to be changed as often as it becomes moist, completes the capillary drain. The gauze is removed in two or three days. Care is necessary in the closure of the uterine wound that the gauze be not caught in a suture, because then its removal would have to be postponed until after the absorption of the suture.

FIGURE 220.



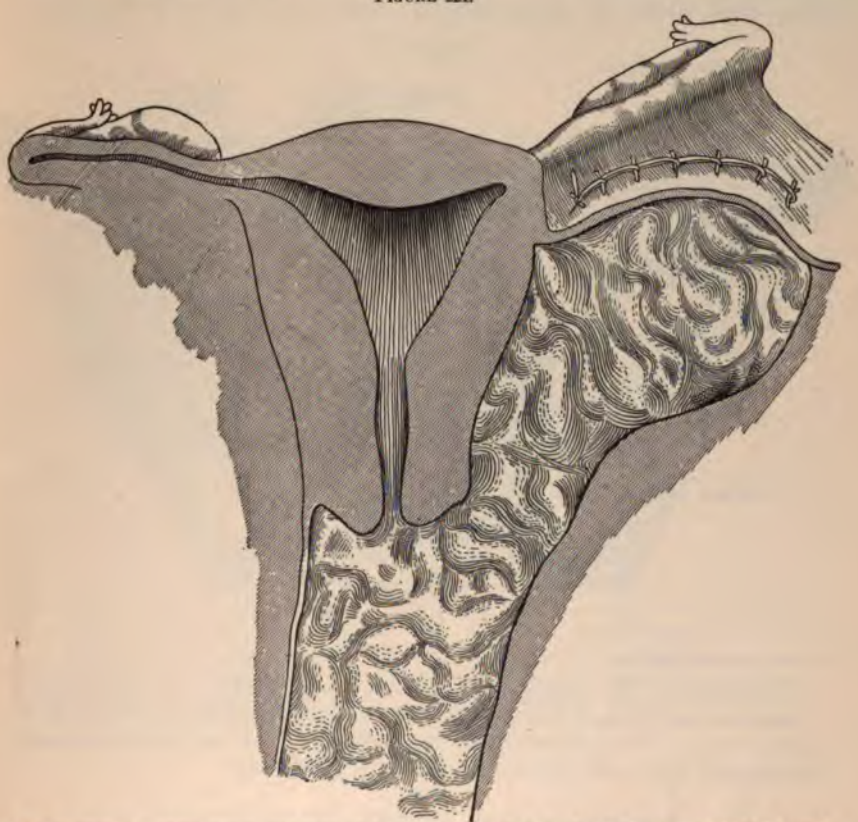
Myomectomy. An intramural myoma has been enucleated; tumor cavity in communication with uterine cavity being obliterated by continuous buried catgut suture; utero-vaginal gauze drain in place.

An intraligamentous myoma may be readily shelled out from its bed between the folds of the broad ligament. The same principles of drainage apply as in the case of intramural tumors, except the route of drainage. This should be, not through the uterine canal, but through an opening which is readily made from the tumor cavity to a point in the vagina just back of or in front of the uterus. In exceptional cases it may be necessary for

purposes of hæmostasis to ligature the ovarian or uterine artery, or both. Experience has shown that sloughing of the uterus from thus cutting off its blood-supply is not to be feared.

Intra-abdominal closure, with vaginal drainage of the tumor-cavity, was early suggested and practised by August Martin, of Berlin, but this surgeon appears not to have developed or practised the method extensively. See Figures 220 and 221.

FIGURE 221.

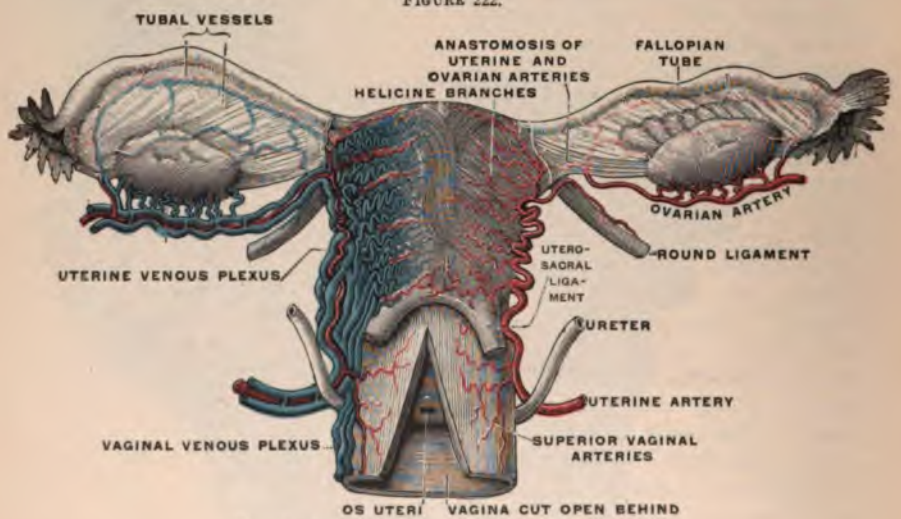


Myomectomy. Intraligamentous myoma has been removed from space between folds of broad ligament. Gauze drain from this space through an opening direct into vagina.

The author's experience since 1889 with the above technique shows: first, almost entire freedom from mortality; second, prompt and uneventful recovery; third, the most gratifying permanent results. The method is undoubtedly applicable to a much larger number of tumors than is generally supposed. Any surgeon who is constantly alert to enucleate the tumor and preserve the reproductive organs will be surprised at the number of cases in which this is entirely feasible. The mutilating operation of hysterectomy for myoma is often necessary, but not so often as the statistics at the present time would indicate. In the vast majority of cases the uterine

appendages will be found normal, and in a large proportion of this majority the tumor may be enucleated from the uterus and the wound successfully closed, precisely as would be required for the removal of such a tumor in any other part of the body. Cases of very large tumors, and cases in which many small tumors are scattered through the uterine wall, may require hysterectomy; but the conservative operation or simple enucleation will often apply when the tumor is even larger than the fœtal head, and in cases of multiple myomata even when there are many tumors. The preservation of the uterus

FIGURE 222.



Vascular supply of the uterus and its appendages.

when the appendages have to be removed is, unless the organ is infected, desirable.

Drainage of the tumor cavity by stitching it into the abdominal wound and packing it with gauze[1] has been successfully carried out in many cases. The vaginal route for drainage, however, offers decided advantages, and will therefore usually be preferred.[2]

2. SUPRAVAGINAL HYSTERO-MYOMECTOMY.

Supravaginal hystero-myomectomy is the removal of the tumor and the corpus uteri, and the supravaginal portion of the cervix, through an abdominal incision, leaving no part of the uterus except the vaginal portion of the cervix. An imperative measure, preliminary to this operation, is scrupulous disinfection of the vagina and the external genitals. See Chapter II. The disinfection is essential, because, first, infection may pass through the cervical canal to the pelvic cavity; and, second, it may become necessary to extend the operation to the removal of the cervix, or to make a free opening into the vagina for drainage.

[1] Polk. E. C. Dudley. Senn.

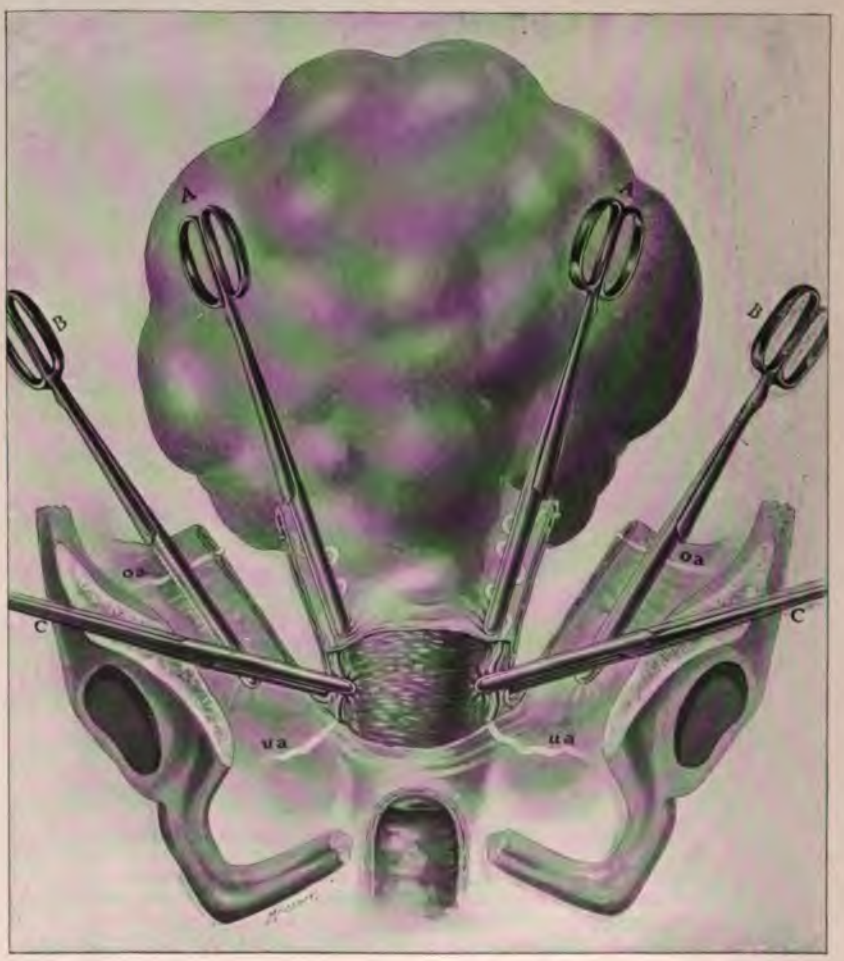
[2] The author used utero-vaginal drainage in myomectomy in April, 1889. Case reported in American Journal of Obstetrics, September, 1889.

FIGURE 223.[1]

Supravaginal Hysteromyomectomy. The ovarian and uterine arteries have been secured by means of strong catgut ligatures, the uterine stump has been closed by a continuous suture running from side to side, and the wound in the broad ligaments is being whipped together by a continuous catgut suture. The ligatures on the uterine arteries are covered in by peritoneum, those on the ovarian arteries are not so covered.

[1] This series of illustrations, Figures 223 to 234, with text, were published in the Journal of the American Medical Association, March 29, 1902.

FIGURE 224.



Supravaginal Hysteromyomectomy. This figure shows the initial steps of the operation:

1. The broad ligament on each side of the uterus has been clamped by means of two long pressure forceps, *A*, close to the uterus, and *B*, parallel to *A* and toward the wall of the pelvis. These two forceps secure the ovarian arteries as they run toward the uterus and as they reach the uterus.

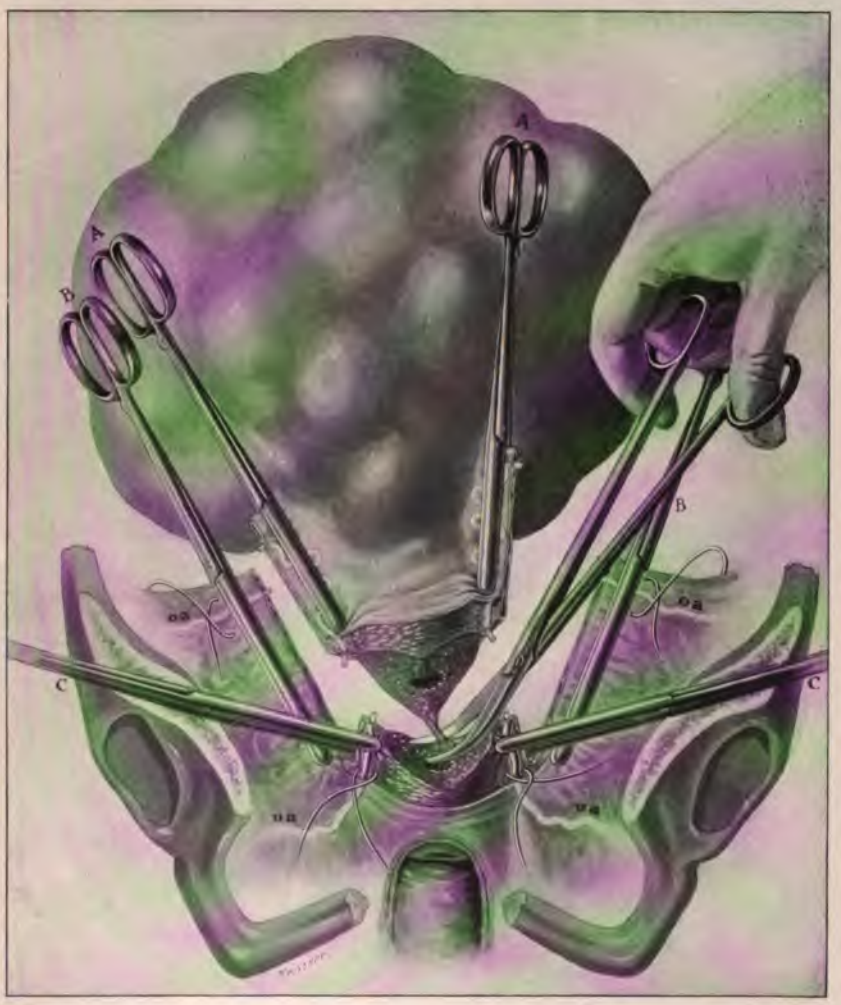
2. The broad ligament on either side between the forceps *A* and *B* has been divided by means of scissors.

3. The peritoneal investment of the uterus has been divided by a circular incision all around the cervix, on a level a little above the attachment of the bladder. This incision is best made by means of a scalpel or sharp-pointed scissors.

4. The peritoneal investment of the uterus below the circumuterine incision, together with the attached bladder, has been stripped down to the level of the uterine arteries, *u a*, *u a*, so that the uterine arteries are exposed.

5. The uterine arteries as they run upward along the sides of the uterus are clamped by means of forceps, *C C*.

FIGURE 225.

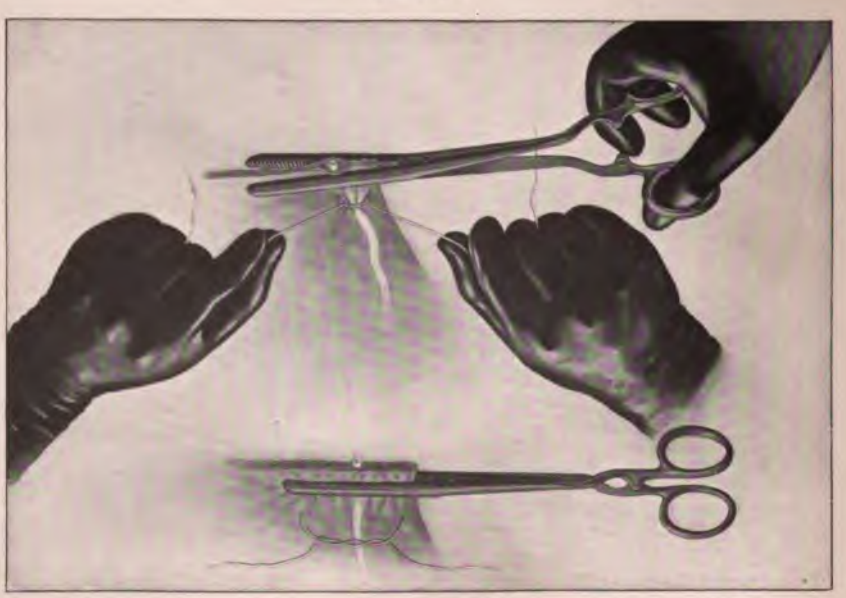


Supravaginal Hysteromyomectomy. Forceps *A A*, *B B*, and *C C*, in place as shown in Figure 224. Ligatures for permanent hæmostasis of the uterus and ovarian arteries in place, but not tied. Uterus being removed by scissors in such a way that the uterine stump may be sutured in a line from before backward instead of from side to side.

FIGURE 226.

Supravaginal Hysteromyomectomy. Ovarian arteries *o a*, *o a*, and uterine arteries *u a*, *u a*, secured by the ligatures which were shown in place but not tied in Figure 225. One free end of each of these ligatures is cut and the others are held in the pressure forceps. Uterine stump closed by continuous suture in antero-posterior direction.

FIGURE 227.

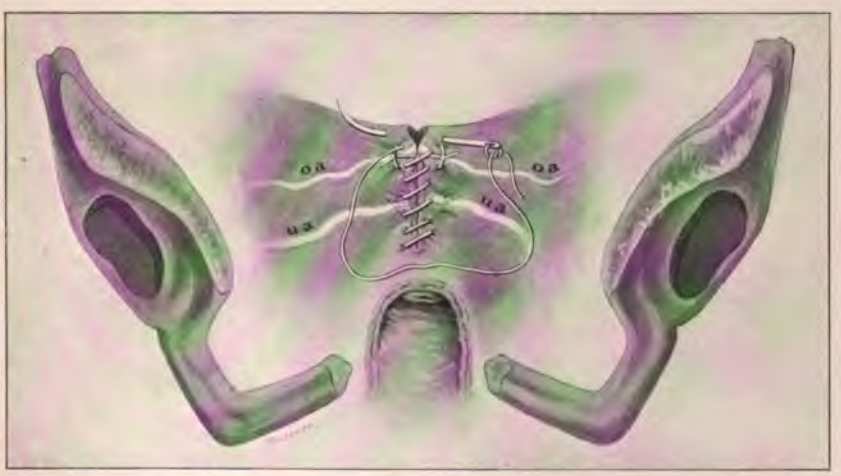


Supravaginal Hysteromyomectomy. A ligature *en masse* surrounding an artery in the broad ligament is being drawn tight and tied; while the operator is tightening the ligature, the assistant is removing the forceps. If the ligature is drawn tight before the forceps are removed the artery will not be sufficiently compressed, and hemorrhage may result.

FIGURE 228.

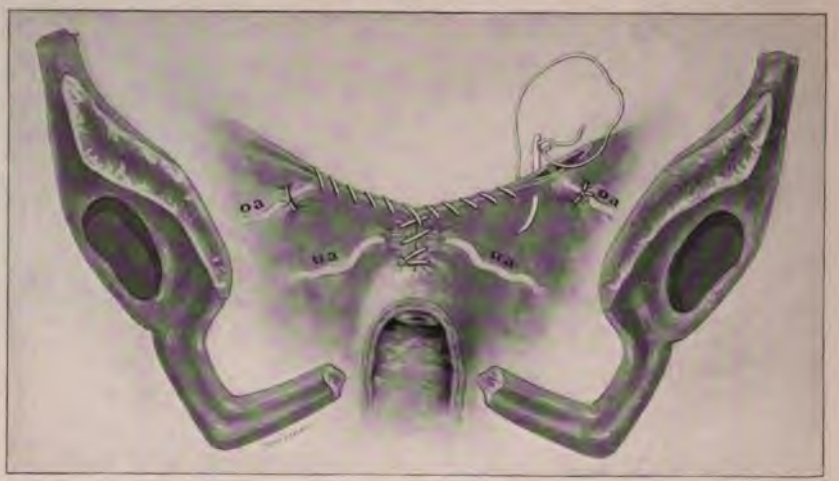
Supravaginal Hysteromyomectomy. *o a*, *o a*, ovarian arteries; *u a*, *u a*, uterine arteries; the cut ends of the two broad ligaments are brought together—end-to-end approximation—by tying the catgut ligatures which are shown in the grasp of pressure forceps, Figure 226. The tying of these ligatures brings the broad ligaments into position for final end-to-end union by a continuous suture. The needle here shows the beginning of this suture. In order to prevent slipping of the catgut ligatures, they should be tied each with several hard knots.

FIGURE 229.



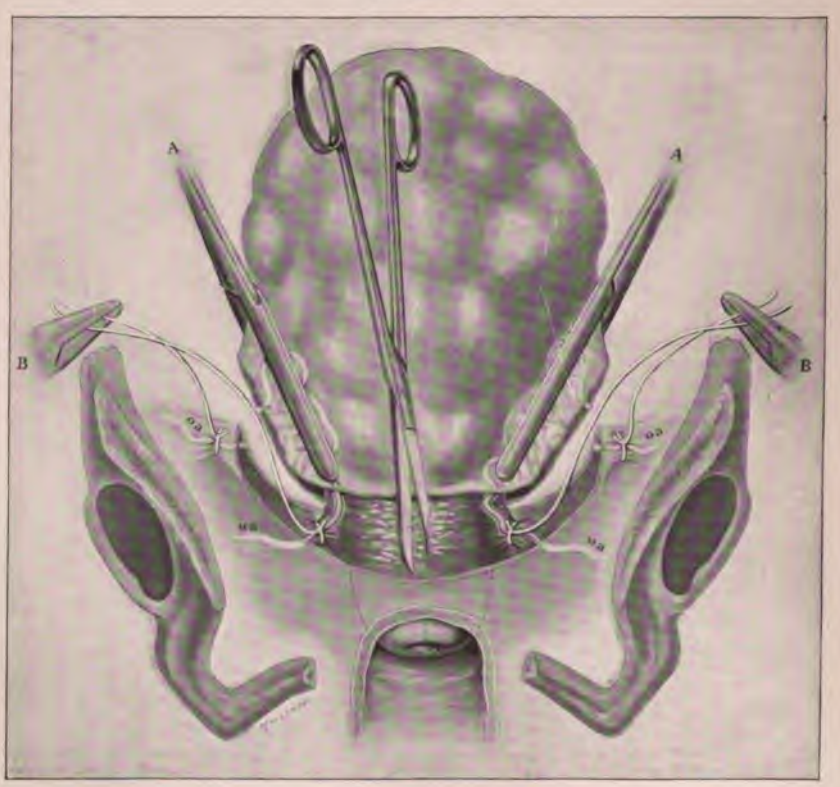
Supravaginal Hysteromyomectomy. *o a*, *o a*, ovarian arteries; *u a*, *u a*, uterine arteries. The continuous suture for end-to-end approximation of the broad ligaments nearly complete.

FIGURE 230.



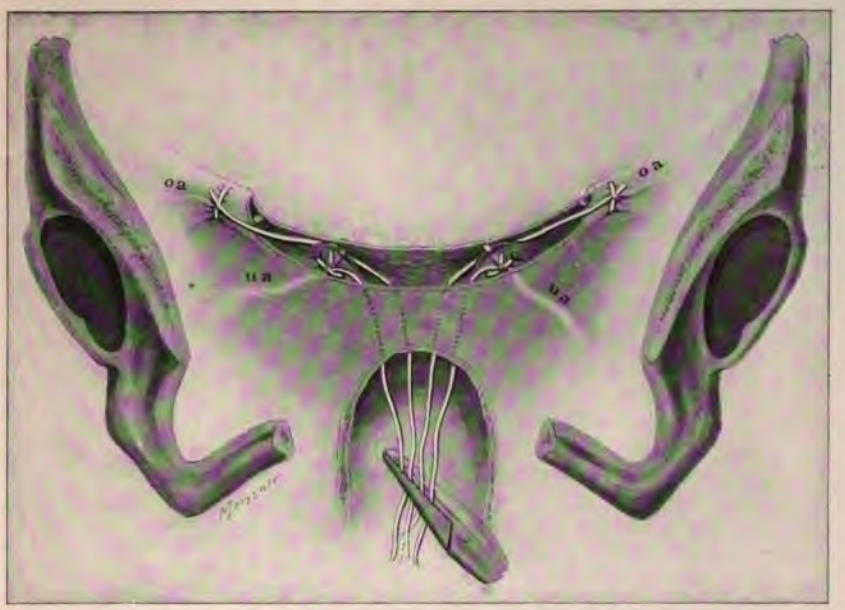
Supravaginal Hysteromyomectomy. *o a*, *o a*, ovarian arteries; *u a*, *u a*, uterine arteries. In the case represented by this Figure the broad ligaments are too short for complete end-to-end approximation. The end-to end approximation is therefore carried only part way, but the ligament and the remainder of the closure is accomplished by a line of union running from side to side. The running suture is nearly complete.

FIGURE 231.



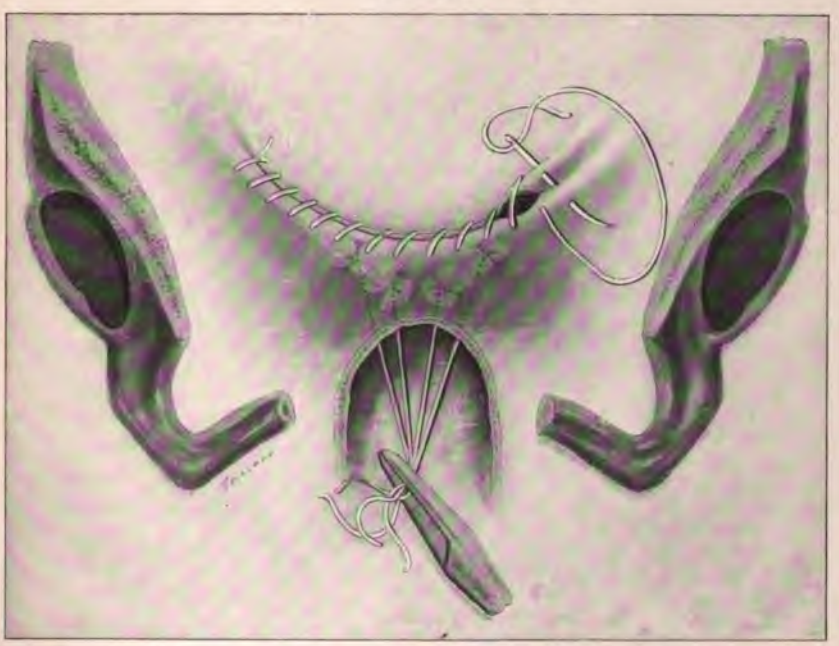
Complete Abdominal Hysteromyomectomy The broad ligaments and circumuterine peritoneum have been divided. See pages 387 and 388.

FIGURE 232.



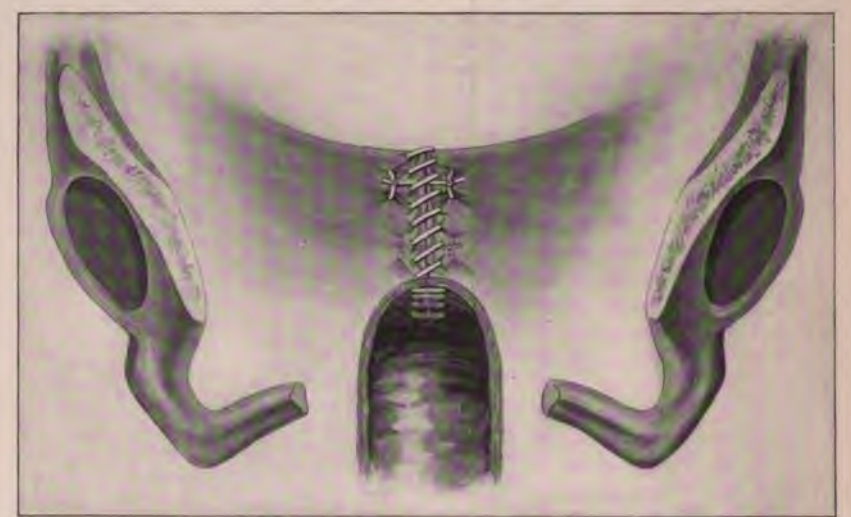
Complete Abdominal Hysteromyomectomy. The entire uterus and tumor have been removed; the long ends of the catgut ligatures on the ovarian and uterine arteries have been drawn down through the vagina to the vulva by pressure forceps passed from the vagina through the vaginal wall and then withdrawn with the ligatures in its grasp.

FIGURE 233.



Complete Abdominal Hysteromyomectomy. While the ligatured masses which contain the ovarian and uterine arteries are being held down into the vaginal wound by pressure forceps in the hands of an assistant, the operator is uniting by a continuous suture the peritoneal margins of the vaginal wound in such a way as to make the entire traumatism extraperitoneal. This suture may include and fix the ligatured masses and hold them below the line of union, and may also catch the upper cut end of the vagina and hold it in contact with the lower part of the broad ligaments.

FIGURE 234.



Complete Abdominal Hysteromyomectomy. Broad ligaments united by end-to-end approximation. Upper cut end of vagina united by antero-posterior line of union from side to side and drawn up by sutures to the lower border of the broad ligaments.

The usual operation is to secure the ovarian and uterine arteries by means of strong catgut ligatures, and after the removal of the tumor, corpus uteri, and supravaginal portion of the cervix, to close the uterine stump by means of a continuous suture running from side to side, and then to close the wound in the broad ligaments by means of another continuous suture also running in the same direction. See Figure 223. This method is open to the following objections: 1. The severed broad ligaments retract to the sides of the pelvis, where they can no longer give adequate support to the bladder, vagina, and rectum; the frequent consequence is exaggerated descent of the pelvic floor with disabling and permanent cystocele and rectocele. 2. The rectum and bladder are brought into close relations with only a thin wall between, so that the possibility of infection from one to the other is increased; 3. In many cases the bladder is drawn over the uterine stump in order to cover it; this may give rise to mechanical irritation of the bladder.

The author has attempted to overcome the difficulties above mentioned by closing the uterine stump in the antero-posterior direction and by end-to-end approximation of the broad ligaments. A description of end-to-end approximation will be found in the twelve accompanying illustrations.

Technique of Supravaginal Hystero-myomectomy. The steps of the operation are these:

A. Abdominal incision.

B. Delivery of the tumor through the abdominal wound.

C. Ligature of the ovarian and uterine arteries, and removal of the tumor together with the corpus and supravaginal portion of the cervix uteri.

D. Toilet of the peritoneum.

E. Closure of the abdominal wound.

A. In case of a large tumor the abdominal incision should be made nearer the umbilicus than the pubes, to avoid the bladder, which by the growth of the tumor not infrequently is drawn up out of the pelvis. The incision, first exploratory—that is, large enough to admit one or two fingers—may, if the operation is to continue, be enlarged sufficiently to permit the delivery of the tumor.

B. The delivery of the tumor through the abdominal wound is sometimes made by pressure on the abdominal walls around the incision, so as to squeeze it out as one would squeeze pus out after opening an abscess. Usually, however, the tumor is delivered by traction with the hands or with heavy vulsellum forceps. In many cases the tumor is fixed so firmly in the pelvis that it cannot be brought through the abdominal wound until after some of the pressure-forceps or ligatures have been placed around the arteries and the mass partially severed from the broad ligaments. If the abdominal incision has been very long, and the intestines are much inclined to protrude through the wound, they may, as soon as the tumor has been brought through, be held back by a large flat gauze pad or by suture of the upper part of the wound. It is clearly important to prevent protrusion of the intestines, and thereby to lessen exposure of the peritoneum.

C. In a majority of all cases of hystero-myomectomy, whether complete or incomplete, the operation may be facilitated by the use of long-bladed forceps to secure temporary hæmostasis of the uterine and ovarian arteries during the removal of the mass, and to be substituted by ligatures as soon as the mass has been removed. See Figures 224 to 227. This use of the forceps will enable the operator to get the tumor rapidly out of the way, and to complete the operation with great speed, and during the operation to avoid hemorrhage. Figures 224 and 225 show the forceps in place, AA and BB securing the ovarian, and CC securing the uterine arteries. The steps of this part of the operation are as follows:

1. Clamp the arteries as shown in the diagrams; forceps BB shut off the ovarian artery as it passes inward through the broad ligament toward the uterus; forceps AA prevent reflex hemorrhage from the utero-ovarian anastomosis at the uterine end of the broad ligament.

2. Divide the broad ligaments by means of scissors.

3. Divide the peritoneal investment of the uterus all around the cervix just above the bladder attachment; this is best done by lightly cutting around the uterus with a scalpel or pointed scissors.

4. Strip the circumuterine peritoneum together with the attached bladder down toward the vaginal portion of the cervix to the region of the uterine arteries. During the stripping off of the bladder the relations of it may be recognized by a sound in the bladder.

5. Clamp the uterine arteries by means of forceps or ligature them at once; in applying the ligatures, care is necessary to avoid the ureters, which sometimes run very close to the uterus. Some operators take the precaution to have a catheter in each ureter in order to keep track of it during the operation.

6. Remove the tumor and all the uterus except the vaginal portion by means of a wedge-shaped incision so directed that the uterine stump may be sutured in a line running from before backward, not from side to side.

7. Place permanent ligatures on the ovarian and uterine arteries and remove the pressure-forceps. It is important that the forceps be loosened by an assistant while the ligatures are being drawn tight, because if tied before the forceps are removed dangerous hemorrhage may result. The uterine arteries are located sometimes by sight, sometimes by touch, and are accordingly secured by ligature, isolated or *en masse*. The ovarian arteries are usually tied *en masse*. *In tying either the ovarian or uterine arteries en masse, it is of great importance to place the ligatures so that the ligatured part will not be deprived wholly of circulation—that is, so that it will receive collateral circulation—and therefore not be subject to necrotic processes. The illustrations show how to apply the ligatures in such a manner as not to produce necrosis of the stump.*

In some cases the tumor so fills the pelvis that the forceps, for want of room, cannot be applied. Then, a temporary elastic ligature having been thrown around the cervix for temporary hæmostasis, the tumor may be enucleated and the size of the mass so reduced that the forceps may be applied As the incision is carried down through the

broad ligament on each side, additional forceps, if needed to control hemorrhage, may be used until the entire mass—tumor, corpus uteri, and supravaginal portion of the cervix—has been removed; then permanent ligatures on the ovarian and uterine arteries and on bleeding points may be substituted for the forceps.

D. The toilet of the peritoneum, which consists of the following steps:

1. Ligature of any bleeding points.

2. Cauterization of the remaining portion of the cervical canal with 95 per cent. carbolic acid; this may be applied on a probe or grooved director. Sponges and instruments used in connection with the cervical canal should for reasons of asepsis not be used elsewhere.

3. Closure of the cervical canal by suture and covering of all exposed surfaces with peritoneum. The author's method of uniting the cervical stump by a line of union in the antero-posterior direction and of bringing together the broad ligaments by end-to-end approximation is set forth in Figures 224 to 230.

4. Drainage if required. In supravaginal hystero-myomectomy drainage is usually not required; *i. e.*, if drainage is indicated it would generally be wise to remove the entire uterus, but if drainage is required it is made best with a continuous strip of gauze passed from above downward through a free opening posterior to the cervix into the vagina; this opening should be enlarged by splitting the posterior wall of the cervix, and if necessary also the anterior wall. A gauze drain if present should usually be removed through the vagina about two days after the operation, and the removal of it followed by gentle douches of 0.5 per cent. lysol in sterile water.

E. The abdominal wound should be closed without drain in the usual manner, as described in Chapter VI.

3. COMPLETE ABDOMINAL HYSTERO-MYOMECTOMY.

The removal of the entire myomatous uterus is indicated: first, when the uterus is septic or otherwise so diseased as to render the presence of any part of it unsafe; second, when on account of extensive traumatism or suppuration vaginal drainage is required. In addition to the above indications there is a certain legitimate latitude of choice, so that the bias of the operator may be in the direction of complete hysterectomy. The operation demands the same antiseptic preparation as already laid down for supravaginal hystero-myomectomy.

Technique of Operation. The abdominal incision; the delivery of the tumor; the clamping and ligature of the arteries; the division of the broad ligaments; and the closure of the wounds, both pelvic and abdominal, are substantially the same as already described for supravaginal hystero-myomectomy. The following description of complete hysterectomy contains, however, certain peculiarities in technique as follows:

When the cervix is accessible through the vagina the first incisions may be made as for vaginal hysterectomy, the bladder and the rectum being stripped away from the cervix, in some cases as far as the peritoneal cavity. The broad ligaments may be separated through

the vagina and tied off as high as practicable. In some cases the uterine arteries may be reached and ligatured. The extent to which this can be done will vary greatly with the individual case. The vagina is now temporarily packed with a continuous strip of gauze. The final removal of the uterus through the abdomen is greatly facilitated even by a small amount of vaginal detachment. The abdomen is then opened and the operation continued as already described for supravaginal hysterectomy; the uterine arteries usually are clamped and tied a little further from the uterus. This necessitates the greatest care not to include the ureters, which cross the arteries very near the uterus. The broad ligaments and circumuterine structures are then divided by means of strong scissors; in making the incisions for this purpose close to the uterus, no harm is done if, on either side, a small portion of the lateral wall of the cervix uteri be left behind. The bladder is stripped away from the cervix as far toward the vagina as practicable and the peritoneum of the posterior wall of the uterus is stripped or dissected off in the same way.

If the vaginal incisions previously have extended into the pelvic cavity, the final removal of the uterus will be easy. If the incisions have not extended so far, the removal will not be difficult; but if no vaginal incisions have been made, the operator may in some cases find it quite tedious, if not difficult, to work his way down into the vagina. The attempt has resulted occasionally in opening the rectum, bladder, or ureter. This difficulty may largely be overcome by a simple device,[1] as follows:

The bladder having been stripped off from the cervix as far down as possible toward the vagina, the uterus is drawn by means of vulsellum forceps well up through the abdominal wound. This traction exposes the anterior wall of the cervix, which is now freely divided with sharp scissors by a longitudinal incision and the cervical canal thereby laid open. See Figure 231. One blade of the scissors is now passed directly down through the external os to the vagina, and the entire anterior cervical wall is divided. The finger now readily passes to the vagina, and serves as a guide for the rapid removal of the uterus by a circular incision around the cervix at the uterovaginal attachment. In some cases it is convenient to reserve the ligaturing of the uterine arteries to this part of the operation. Small bleeding vessels are tied or twisted.

If drainage of the pelvic cavity is required, it should be vaginal, and the vaginal wound should be left open or partly open for that purpose. The drain is introduced as follows: the end of a long strip of gauze, double thick and two inches wide, is passed from the pelvis through the vaginal wound to the vulva; then the gauze is packed lightly from below upward, so as to fill the vagina and the vaginal wound, and to cover all surfaces in the pelvis left exposed by the operation. The dressing over the vulva which receives the capillary drainage from the gauze should be kept dry by frequent changing.

[1] This method of excising the cervix from the abdominal side of the pelvic floor has been used by the author for several years with great satisfaction.

The gauze drain, being a continuous strip, may easily be removed through the vagina in two or three days.

If drainage is not required, the wound should be closed completely both on the vaginal and the peritoneal side. This may be done by lines of union from side to side as shown in Figures 232 and 233, or by end-to-end approximation of the broad ligaments as already described for supravaginal hystero-myomectomy. Figure 234 shows the upper cut end of the vagina closed by side-to-side union, and the peritoneal part of the wound closed by end-to-end approximation of the broad ligaments. If end-to-end approximation is employed, the same sutures that unite that part of the broad ligaments nearest to the vaginal wound should also catch up the upper cut end of the vagina so as to draw it into the space from which the cervix has been excised, and unite it to the lower portion of the broad ligament stumps at or near the point where the ligatures surround the uterine arteries; this serves to draw the vagina strongly upward and to cover the exposed surfaces between the vagina and broad ligaments.

Upon completion of the operation the vagina should be packed with gauze from the vaginal wound to the vulva, and a large gauze dressing placed over the vulva to absorb any wound secretions, and held there by a T-bandage, and changed often to keep it dry; the vaginal gauze is removed in about three days, and vaginal douches of 0.5 per cent. lysol are then given twice a day.

In hystero-myomectomy, the ovaries, if normal or nearly normal, for reasons already given in Chapter XXXIII., should be preserved.

In all operations for hystero-myomectomy the ligatures and sutures should be of catgut.

Advantages of End-to-end Approximation of the Broad Ligaments in Hystero-myomectomy.

1. The broad ligaments, in an anatomical sense, take the place of the excised uterus and form a pouch posteriorly like the cul-de-sac of Douglas, and anteriorly a depression that answers to the utero-vesical pouch.

2. The broad ligaments, thus united, hold up the rectum, bladder, vagina, and other parts of the pelvic floor, and in so doing prevent the descent of these organs which so commonly results from hysterectomy as ordinarly performed.

3. The broad ligaments in occupying the space left by the removal of the uterus prevent the intimate union of the rectum and bladder—a union which would leave only a thin wall between, through which infection might pass from one to the other.

4. The operation is performed more easily and quickly by this method than by that of side-to-side union of the wounded ligaments.

I have united the ligaments by end-to-end approximation often enough to be convinced of the feasibility and utility of the method.

Prognosis of Myoma Uteri, after Operation.

The danger in the removal of a uterine myoma varies with the skill of the operator, the location and relations of the tumor, and the condition of the patient. The mortality of the abdominal operation in the hands of the average operator has been placed at about 15 per cent. This is too high. Under favorable conditions an expert surgeon should have at least 95 per cent. of recoveries. Statistics usually show a mortality of about 25 per cent. in the removal of intraligamentous tumors with broad uterine connections and of supravaginal tumors of the upper part of the cervix. This, again, is too high. The method already described for the removal of these tumors by myomectomy with gauze drainage into the vagina, when required, closure of the tumor-cavity in the abdomen, and, if necessary, ligature of the uterine vessels, has reduced the mortality to a very small percentage. Vaginal extirpation of the small myomatous uterus shows a mortality of not more than 2 or 3 per cent. The removal of a tumor from the infravaginal portion of the cervix and the removal of intra-uterine tumors through the vagina are practically without danger. The long-continued menorrhagia associated so commonly with uterine myomata may so exhaust the woman as greatly to decrease her resistance, and thereby to increase the danger of an operation; hence the occasional necessity of preparatory curettage, uterine tamponade, general treatment, and delay in some cases for weeks or months, until the systemic condition is favorable.

Myomectomy during Pregnancy.

The following conditions more or less strongly contraindicate surgical treatment during pregnancy: 1. Small size and slow growth of the tumor. 2. Location of the tumor where it will not materially interfere with utero-gestation or obstruct delivery. 3. Probability that it will rise spontaneously, or that it may be forced manually out of the pelvis into the abdomen, where it will not interfere with pregnancy or parturition. The opposite of these conditions may call for surgical measures. The following radical measures should be considered:

If the fœtus is not viable, abortion, and, later, myomectomy or hysterectomy.

2. If the child is viable, Cæsarean section or Porro's operation, or complete hysterectomy.

3. Removal of the tumor without interrupting pregnancy or sacrificing the uterus.

If surgical interference is inevitable, and gestation has not advanced beyond the end of the third month, the indication is for abortion. Interruption of gestation at this time, and a radical operation for the removal of the tumor later, would be the safest course. After the third month the danger of induced abortion is increased enormously. This increase comes from the difficulty of delivering the placenta, from infection, and from hemorrhage. Cæsarean section,

PLATE VIII.

Myomatous Uterus, five months pregnant. Twisted Pedicle, Infection of Myoma and consequent Peritonitis; Hysterectomy; Death from Nephritis. (Specimen furnished by Dr. A. C. Haven.)

to be followed immediately by complete hysterectomy or supravaginal hysterectomy, may now, in the interest of the child, be deferred, if possible, to the period of viability—that is, to the end of the seventh month or later. The removal of the tumor without sacrificing the uterus or interrupting gestation may be preferred when the tumor is subperitoneal and removable with small uterine traumatism. This operation is indicated specially in subperitoneal pedunculated tumors.

An infected myoma demands immediate radical measures, and if the uterus also is infected may call for not only myomectomy, but for hysterectomy as well. See Plate VIII.

CHAPTER XXVIII.

TUMORS OF THE UTERUS (CONTINUED).

CARCINOMA AND ENDOTHELIOMA.

Pathology.

CARCINOMA may arise from any portion of the uterine mucosa—*i. e.*, from the cylindrical epithelium of the corporeal or cervical glands, from the surface cylindrical epithelium of the interior of the uterus, or from the pavement epithelium outside of the external os. The variety of the cancer usually corresponds to the type of epithelium from which it springs. Cylindrical cell carcinoma occurs on the corporeal and intracervical mucosa, and the pavement-cell variety occurs on the external vaginal surface of the cervix. This rule is not invariable. Eversion of the intracervical mucosa is quite common—see Laceration of the Cervix—hence the frequent formation of the cylindrical cell carcinoma outside of the apparent os externum. On the other hand, pavement epithelium may be present in the cervical canal, or even beyond the internal os in the uterine cavity, and there give rise to pavement-cell carcinoma.[1] Moreover, it is possible for the epithelium of a carcinoma already formed to undergo changes from one type to another.

From the pathological standpoint there are thus two varieties of carcinoma. One type is that in which the squamous cells of the cervix have multiplied in an atypical manner and have invaded the deeper tissues; this carcinoma is like the epithelioma which occurs at the junction of the skin and mucosa of the lip. The other type is that in which the cylindrical cell gland acini of the interior of the cervix and corpus uteri multiply in an atypical manner, invade the interglandular stroma, and thus conform to the carcinomatous type. The two varieties of carcinoma are, therefore, called:

1. Cylindrical cell carcinoma, adeno-carcinoma, gland carcinoma.
2. Pavement-cell carcinoma, squamous carcinoma, epithelioma.

Carcinoma of the cervix usually originates near the os externum, where the cylindrical and pavement epithelium meet, and is therefore either a cylindrical cell or a pavement-cell carcinoma, or both. Early in the disease the tendency of the former is to extend to the submucous structures, and of the latter to confine itself more to superficial areas.

When the deeper tissues are involved in carcinoma the affected portion is enlarged, hard, marble-like, and friable. The surface is smooth, glistening, and flattened, or may be nodular. Either variety rapidly

[1] Ries. American Gynecological and Obstetrical Journal, February, 1896; Zeitschrift für Geburtshülfe und Gynäkologie, vol. xxiv.

extends and ulcerates early. The margin of the ulcer is irregular, hard, and usually raised. The base is irregular and bleeds easily. The ulcerative process may slowly or rapidly destroy the cervix. This form has been called infiltrating or nodular carcinoma.

FIGURE 235.

Diffuse carcinoma of the body of the uterus.

Carcinoma may extend from the cervix uteri:

1. To the vaginal vault, anteriorly or laterally, less often posteriorly. The advancing margin of the growth is raised, rounded, and hard.
2. To the broad ligaments giving them on digital touch a hard, board-like feel.
3. To the vesico-vaginal septum, less often to the rectum.
4. Rarely to the uterine appendages, urethra, or pelvic bones.
5. To the corpus uteri—frequently.
6. To the iliac glands—not usually until the disease has involved the broad ligaments; this delay is because the squamous cancer cells are too large to pass through the lymph-radicles of the cervix, but not too large to traverse the lymph-vessels of the ligaments.
7. After the disease has passed beyond the cervix uteri the kidneys and ureters are usually involved in nephritis, hydronephrosis, or pyelonephrosis. Dilatation of the ureters is the common result of

inflammatory constrictions near the invading growth, pressure of the growth on the ureter, or extension of the growth to the ureter.

FIGURE 236.

Carcinoma of the cervix, involving the parenchyma of the vaginal portion.[1]

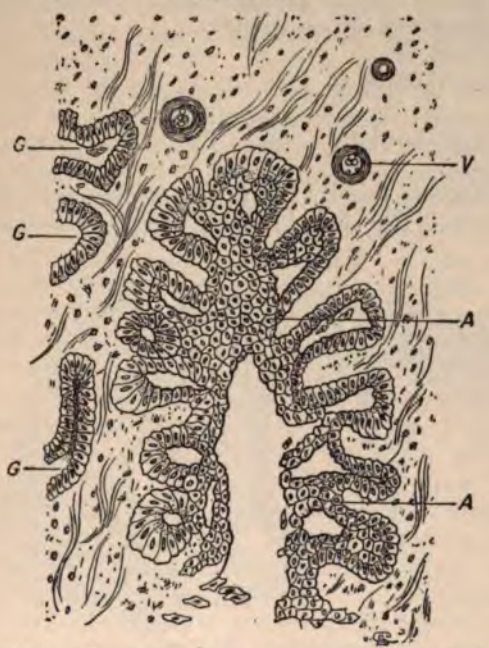
FIGURE 237.

Carcinoma of the cervix uteri; cavity of cervix excavated.[2]

[1] Ruge and Veit, from American System of Gynecology. [2] Ibid.

8. Metastatic cancer extending from the cervix uteri direct to distant organs is not common.

FIGURE 238.



Cylindrical-cell carcinoma. Transformation of atypical gland structures.[1] *A, A.* Atypical transformation of the epithelial covering of the arbor vitæ. *G, G.* Normal Glands. *V.* Vessels.

Carcinoma may extend from the corpus uteri:

1. To the broad ligaments and parametria, and thence to any adjacent structures, such as peritoneum, omentum, mesentery, intestines, Fallopian tubes, and ovaries; all these organs are involved late, or not at all; complicating cancer of the liver and lungs is rare.

2. To the lumbar glands, common; to the inguinal glands, not common; the iliac glands are more liable to involvement from cancer of the cervix.

3. To the cervix uteri.

Etiology of Carcinoma Uteri.

The etiology may be summed up as follows:

1. Age—the disease occurs most frequently between forty and fifty. The extreme limitations are between eight and seventy-six.
2. Heredity—an occasional predisposing cause.
3. Social state—more frequent among the poor and ignorant.
4. Race—rare among negroes.
5. Trauma of labor—laceration of the cervix a recognized predisposing cause.
6. Endometritis and endocervicitis.

[1] From Bonnet et Petit.

Symptoms and Course of Carcinoma Uteri.

There are no incipient symptoms, nor at any time in the course of cancer are the symptoms pathognomic. As the disease progresses the following disorders always appear:

1. Hemorrhage.
2. Uterine discharges.
3. Pain.
4. Visceral disorders.
5. Cachexia.

1. Hemorrhage is usually the first symptom, and is the result of accidental injury to the friable mass, rarely to ulcerative processes.

FIGURE 239.

Pavement-cell carcinoma—*i. e.*, epithelioma. Transformation of typical to atypical gland structures.[1] *p.* Pavement epithelium. *k.* Cancer. *kn.* Cancer nodules. *dr.* Remains of gland.

It is, unfortunately, often attributed to irregularities of the menopause or to a return of menstruation after that period; hence the fact that the bleeding of carcinoma is often disregarded until the disease has progressed beyond the hope of cure. The reappearance of hemorrhage one, two, three, or more years after the menopause is strong presumptive evidence of cancer, and demands immediate examination. The loss of blood, at first slight, is commonly noticed after straining at stool, or vigorous exercise, or coitus. With the progress of the disease the hemorrhage increases; it may be nearly or quite constant, may occur at irregular intervals, or in the form of menorrhagia at the catamenia. Usually the patient's strength is slowly exhausted by a persistent, slow seeping away of the watery blood. On the other hand, profuse, even dangerous, hemorrhages are possible.

The menstrual history bears no very significant relation to the development of carcinoma. The disease in many cases follows the menopause.

2. Uterine Discharge. The character of the discharges varies with the progress of the disease:

a. Early; discharge watery, serous, transparent, inodorous.

b. Later; discharge watery and malodorous.

c. As ulceration increases and growth becomes friable, the dis-

[1] Ruge and Veit, from American System of Gynecology.

charge is more profuse, bloody, turbid, sometimes purulent, and always of a most nauseating odor. This latter symptom continues more or less constant to the end, and is characteristic of malignancy. The discharge is called "carcinomatous ichor," or "cancer juice." All excessive discharges, especially after the menopause, should be regarded with suspicion.

3. Pain is rarely present while the growth is confined to the vaginal portion of the cervix. Involvement of the corpus uteri and of the structures around the uterus may give rise to sharp, lancinating pains. These pains, although often described as pathognomonic, are by no means constant or confined to cancer. They may be supplemented by the pains of pelvic peritonitis. The peritonitis protects the general peritoneum by adhesions which form in front of the invading carcinoma. The pains are due to pressure on the pelvic nerves or to actual involvement of those nerves in the carcinoma; they are commonly referred to the region of the pelvis, perineum, or thighs, and usually indicate that the disease is past operative cure. The retention of secretions in the uterus from occlusion of the cervical canal by the invading carcinoma may give rise to hydrometra or pyometra, and cause spasmodic expulsive uterine pains like labor pains.

4. Visceral Disorders may be consequent upon pressure or invasion of neighboring organs. The bladder becomes irritable. Vesical catarrh, strangury, painful urination, pyuria, and cystitis may follow. Vesico-uterine or vesico-vaginal fistula often results from the destructive ulcerative processes. Uretero-uterine and uretero-vaginal, recto-uterine and recto-vaginal fistula may occur in the same way. Nephritis, uræmia, hydronephrosis, and atrophy of the kidney are among the usual resultant complications. Constipation is explained as follows: First, the patient, through fear of pain and bleeding, voluntarily retains the feces; second, the feces become dry and hard from loss of water in the ichorous discharges; third, the bowel is incapacitated by the disease for the ready expulsion of its contents. Diarrhœa may be caused by irritation of the bowel from the invasion of the cancer. Alternating constipation and diarrhœa are common.

5. Cachexia appears not very late in the course of the disease, and is a characteristic symptom. It is marked by emaciation, a yellowish pallor of the skin, profound anæmia, and great depression of both mind and body. It is caused by sapræmia from the absorption of necrotic tissue and by malnutrition due to anorexia, vomiting, pain, and hemorrhage.

Diagnosis of Carcinoma Uteri.

The sooner the carcinomatous uterus is removed, the greater the protection against recurrence; hence the earliest possible diagnosis is imperative. Absolute diagnosis must depend usually upon the microscopic findings. A probable diagnosis may often be made by

1. The clinical history.
2. The physical signs.

1. **The Clinical History**, as indicated in the foregoing paragraphs, gives strong evidence, though not proof of cancer.

2. **The Physical Signs** are demonstrated by conjoined examination and inspection. The extremely fetid odor, which clings to the examining finger despite much washing and the prolonged use of the nail-brush, may usually be avoided by the free use of glycerin as a lubricant. The infiltrating carcinoma of the cervix is recognized as a thick, usually hard, more or less nodular, friable growth. The friability and bleeding are almost pathognomonic. The ulcers, if present, have an irregular, hard, raised margin, and uneven base, and bleed freely upon slight injury. Through the speculum the surface before ulceration appears smooth or nodular, marble-like, and glistening. After ulceration the surface is ragged and irregular, and may show large excavations from the sloughing of carcinomatous tissue. The entire cervix may be destroyed in this way. The papillomatous superficial variety appears as a soft, friable, bleeding, cauliflower-like mass.

Diagnosis of Carcinoma of the Cervix Uteri.

Carcinoma of the cervix may in the beginning without great care be overlooked. The cervical wall around the external os may be only slightly thickened on the affected side. The indurated tissue may appear almost insignificant in amount. Extreme friability and persistent bleeding on slight abrasion will, however, be strong diagnostic factors. Subjective symptoms may even be absent. Excision of a small piece for microscopic examination is now imperative. This should be wedge-shaped, and should include a portion of the surrounding healthy tissue. The slight wound may be closed by one or two sutures. Cervical scrapings are usually unfit for examination.

Diagnosis of Carcinoma of the Corpus Uteri.

Carcinoma of the corpus uteri is in the beginning often impossible to recognize. It is apt to appear between the ages of forty and fifty. There is increased and irregular menstruation, which is often wrongly attributed to the menopause. The presence of a slight watery discharge, even though odorless, is highly diagnostic. If the discharge is very malodorous, the evidence is much stronger. The general strength of the patient may be almost up to the normal standard. Conjoined examination shows nothing save, perhaps, a slight enlargement of the uterus. Life may now depend upon a speedy diagnosis. The whole question centres in the product of curettage and the microscopic findings. Should no microscopic evidence of cancer be found, the curettage should be repeated whenever the hemorrhage reappears. In cancer the discharge always recurs promptly. The scrapings are usually much more abundant than in benign growths.

Frequently recurring glandular hyperplastic endometritis with much cystic development after repeated curettage, especially if associated with free hemorrhage and a watery discharge, should give rise to grave apprehension, and would justify the removal of the uterus on suspicion.

Advanced carcinoma of the body of the uterus is recognized by

the symptoms already described and by conjoined examination. The uterus is enlarged—often two or more times its normal size. It is hard, nodular, and, in the later stages, more or less fixed. Early fixation also occurs in cervical cancer. The causes of fixation are similar to those which produce the same condition in pelvic inflammation—*i. e.*, the extension of the disease through the lymph-channels to the parametria. The lower extremities become œdematous from hydræmia, from pressure, and from thrombosis of the pelvic veins. Emboli may be dislodged from the thrombi and carried to the lungs. The fatal result is then from embolism, septic pneumonia, and pulmonary œdema. This also occurs in carcinoma of the cervix. The absolute diagnosis may depend upon the microscope. The recognition, however, of advanced carcinoma, whether of the cervix or corpus, even without the microscope, is usually not difficult. "He who runs may read."

The following diagnostic signs will distinguish pavement-cell carcinoma from cylindrical cell carcinoma:

PAVEMENT-CELL CARCINOMA—EPITHELIOMA.	CYLINDRICAL CELL CARCINOMA—ADENOCARCINOMA.
1. Originates in pavement-cell epithelium and follows that type.	1. Originates in cylindrical cell epithelium and follows that type.
2. Forms solid finger-like or branching ingrowths.	2. Forms gland prolongations.
3. Epithelial pearls may be formed.	3. Absent.
4. Solid alveoli formed.	4. Glandular structures always recognizable.
5. Breaks down rapidly and bleeds freely.	5. Breaks down more slowly.

Differential Diagnosis of Carcinoma Uteri.

1. Myoma.
2. Sarcoma.
3. Retained placental tissue.
4. Incomplete abortion.
5. Hypertrophy of the cervix.
6. Endometritis.
7. Endocervicitis.
8. Syphilis.
9. Chronic metritis.
10. Ichthyosis.
11. Tuberculosis.
12. Laceration of the cervix.

The conditions most liable to be mistaken for carcinoma are:

The differential diagnosis will be found in the following parallel columns and paragraphs:

ADVANCED CARCINOMA OF THE CORPUS UTERI.	SLOUGHING SUBMUCOUS MYOMA.
1. Cachexia, hemorrhage, and very foul discharges.	1. Anæmia from hemorrhage; discharges less foul.
2. Sloughing tissues very friable.	2. Tough, not friable.
3. Cervix may be involved by extension.	3. Cervix not so involved.
4. Characteristic epithelial proliferations seen by microscope.	4. Absent.
CARCINOMA UTERI.	SARCOMA UTERI.
1. Frequent.	1. Very rare.
2. Diffuse.	2. Rather sharply defined.
3. Surface not smooth.	3. Previous to necrosis surface usually smooth.
4. Trabeculæ seen on cross-section.	4. Cross-section shows smooth, homogeneous surface.
5. Gland formation, abundant stroma, blood-vessels with walls in stroma.	5. Cells round or spindle-shaped, little or no stroma; in place of bloodvessels with walls there are blood-spaces in direct relation with surrounding cells.

Carcinoma of Corpus Uteri.	Retained Placental Tissue.
1. History of pregnancy commonly absent.	1. History of recent pregnancy.
2. Hemorrhage from uterus.	2. Same.
3. Quantity of tissue removed by curette may be large.	3. Quantity always large.
4. Scrapings composed of short, friable threads having shaggy appearance.	4. Scrapings composed of myriads of long, slender threads having shaggy appearance.
5. Microscopic examination shows carcinoma.	5. Microscopic examination shows products of conception.
Carcinoma of the Corpus Uteri.	**Incomplete Abortion.**
1. No history of pregnancy.	1. History of pregnancy and abortion.
2. Scrapings on microscopic examination show carcinoma.	2. Scrapings on microscopic examination show products of conception.
3. Cachexia.	3. Anæmia.
Carcinoma of the Cervix Uteri.	**Hypertrophy of the Cervix Uteri.**
1. Cervix enlarged, friable, breaks down rapidly and bleeds freely to touch.	1. Cervix enlarged, tough, and does not bleed freely to touch.
2. Characteristic offensive watery discharge —"cancer juice."	2. Absent.
3. Microscopic examination of excised portion shows carcinoma.	3. Shows cervical structures modified only by hypertrophy.

Endometritis. The microscopic differential diagnosis has been set forth in the chapter on Endometritis. See clinical diagnosis of the two diseases, as presented in the respective chapters. Polypoid endometritis is distinguished from carcinoma of the corpus uteri by the following characteristics:

1. Polypoid eminences not sharply defined.
2. Friability not marked.
3. Underlying muscularis not invaded.

Endocervicitis. Cystic and polypoid glandular enlargement due to endocervicitis have certain characteristics which might lead one to mistake them for cancer.

Cystic glandular enlargement (cystic degeneration) of the Nabothian follicles may be distinguished from cancer by the following characteristics:

1. The large, hard nodular cervix is smooth, non-friable, and has no tendency to bleed.
2. Puncture of cysts reveals mucous contents.
3. Progress of disease very slow.
4. Microscopic section shows cysts lined by a single layer of epithelium, with tunica propria unbroken and surrounded by normal stroma.
5. Condition generally due to laceration of cervix and eversion of the cervical mucosa.

Polypoid glandular enlargement (mucous polypi) differs from carcinoma in the following particulars:

1. Springs from area within cervical canal.
2. Lips of cervix intact.
3. Polypi rather firm, not friable, and bleed but little.
4. Microscopic section shows single layer of epithelium and normal or hypertrophied cervical glands.

Syphilis will be known by the clinical history. In doubtful cases specific treatment should clear the diagnosis.

Chronic Metritis. Chronic metritis shows a history of inflammation, is usually associated with endometritis, does not cause the carcinomatous cachexia nor the offensive watery discharge. On conjoined examination the uterus is symmetrical, while a carcinomatous uterus is often nodular.

Ichthyosis Uteri. This condition, first described by Zeller,[1] 1884, is marked by the presence of two or more layers of stratified epithelium; in the cavity of the uterus it has been observed in connection with inversion of the uterus, with cervical polypi, and, according to Zeller, with chronic endometritis. Transition of columnar to pavement-cell epithelium occurs in hydrometra and hæmatometra, and in extra-uterine pregnancy; the transformation may occur where, from any cause, the mucosa is stretched and flattened, and such epithelium may become stratified. The condition gives rise to no unusual symptoms except such as would ordinarily be observed in endometritis or in the beginning of carcinoma in the corpus uteri. The scrapings of stratified epithelium under the microscope may have a similar appearance in ichthyosis uteri and carcinoma uteri. If the microscopic findings show that the stratified epithelium is limited to the superficial structures, the case is one of ichthyosis uteri. If the epithelium penetrates the underlying connective tissue, or muscular layer, it is carcinoma. Just as glandular hypertrophy may be the starting-point of carcinoma, so may ichthyosis.

Tuberculosis of the Uterus. Tubercular disease in the uterus varies according to the location.

Tuberculosis of the endometrium is distinguished from carcinoma by the following characteristics:

1. Mucosa at first smooth, yellowish white, and glistening; later, yellowish-white nodules appear on surface and below surface of endometrium.
2. Finally, nodules undergo caseous degeneration and ulceration.
3. At times small yellowish tubercles surround ulcers.
4. Disease may involve entire endometrium and may extend through the muscularis to the perimetrium.
5. Hemorrhages not characteristic.

Tuberculosis of the cervix presents the characteristic ulcerative processes of lupus.

1. Margins of ulcers are well defined, or may be undermined, and are surrounded by tubercles.
2. Base of ulcers is studded with tubercles and covered with pus, necrotic tissue, or caseous matter.
3. Microscopic section shows giant cells and tubercular disease.

Tuberculosis differs from carcinoma in all the above particulars.

Laceration of the Cervix Uteri. This condition is characterized by inflammatory and mechanical results that closely resemble carcinoma of the cervix. They are:

1. Eversion of the intracervical mucosa and cystic degeneration of

[1] Zeller. Plattenepithel im Uterus (ichthyosis uterina). Zeitschrift für Geburtshülfe und Gynäkologie, Band xi. Ries. Eine neue Operationsmethode des Uteruscarcinoma. Zeitschrift für Geburtshülfe und Gynäkologie, Band xxiv. Ichthyosis, American Gynecological and Obstetrical Journal, February, 1896.

the Nabothian follicles (see Endocervicitis, in one of the foregoing paragraphs.

2. The everted eroded surfaces present an irregular and sharply defined line of demarcation.

3. Approximation of the lacerated margins by means of tenacula causes the everted mucosa to be rolled in and to disappear.

4. The cervix, if indurated, presents the peculiar hardness of hypertrophy; not the friability of carcinomatous infiltration.

5. In all the above particulars this condition differs from cancer In doubtful cases microscopic examination is essential.

The differential diagnosis of carcinoma of the body of the uterus may be rendered difficult by such associated lesions as myoma, sarcoma, endometritis, salpingitis, and ovaritis.

Causes of Death from Carcinoma Uteri.

The causes of death are:

1. Exhaustion.
2. Sepsis.
3. Hemorrhage.
4. Uræmia.
5. Intercurrent diseases, such as peritonitis and pneumonia.

Hemorrhage, although it may slowly exhaust the vitality, is rarely a direct cause of death. Fatal peritonitis seldom occurs from extension of the disease. In the vast majority of cases death is from marasmus or uræmia, or both.

Prognosis of Carcinoma Uteri.

The sole hope of radical cure is in surgical removal of the carcinoma. All drugs are of questionable value or useless. If the growth has progressed beyond the limits of a radical operation, death in the near future is inevitable. The disease will sometimes destroy life in a few months or weeks; it may for a time become apparently inactive, or develop very slowly, and then go on to a rapid termination. The prognosis as to the limit of life should be guarded. A general statement that death is more liable to occur within one year than after two years would usually be safe.

Diagnosis of Recurrence of Cancer after Removal.

After hysterectomy under the following conditions, recurrence may be suspected:

a. Pain radiating to hip and thigh.
b. Œdema in lower extremities.
c. Cachexia and failing health.

Diagnosis of Extension of Carcinoma Uteri.

Carcinoma of the uterus may extend to adjacent and other organs, as follows:

1. *Extension to the Vagina*, recognized by:
   - *a.* Cartilage-like hardness and nodules in the vaginal vault, due to carcinomatous infiltration.
   - *b.* Ulcers in vaginal vault having hard border and bleeding base.
2. *Extension to the Rectum*, recognized by:
   - *a.* Bloody, offensive discharge from rectum.
   - *b.* Rectal touch shows irregular hard post-uterine mass extending into rectum.
   - *c.* Rectal mucosa fixed to mass and ulcerated; borders of ulcerated surfaces hard and raised.
3. *Extension to Bladder*, recognized by:
   - *a.* Cystoscopy, conjoined examination, digital touch through artificial vesico-vaginal fistula.
   - *b.* Digital palpation of bladder through urethra; not advised.
   - *c.* Hæmaturia.
4. *Extension to Parametria*, recognized by:
   - *a.* Cancerous infiltrate harder than inflammatory infiltrate. The inflammatory infiltrate, unlike that of carcinoma, first forces the uterus to the opposite side, and later, as the mass disappears, contracting structures draw it toward the affected side. Fixation of the uterus is not a reliable sign, because the uterus may also be fixed by inflammatory infiltrate.
   - *b.* Carcinoma of the supravaginal portion of the cervix gives rise to early infiltration of the parametria; carcinoma of the infravaginal portion gives rise later, and carcinoma of the corpus still later.
   - *c.* Hard mass extends first from posterior wall of the cervix to the back of the pelvis, later to the sides; best palpated through the rectum.
5. *Extension to the Glands:*
   - *a.* The iliac glands are the first to be involved in cancer of the cervix, and are best palpated under narcosis per rectum, in front of the sacro-iliac joint; infiltration of the parametrium precedes infiltration of the glands.
   - *b.* The lumbar glands involved in cancer of the corpus uteri are palpated only under anæsthesia through the abdominal walls when they are thin and relaxed.
6. *Extension by Metastasis* to other organs is a late manifestation, of which an early positive diagnosis is impossible.

Treatment of Carcinoma Uteri.

The treatment is radical when the cancer has not extended beyond the limits of entire removal; palliative, when it cannot all be removed. The radical treatment should always be complete hysterectomy. The old practice of high amputation of the cervix for cervical cancer should never be resorted to, for one can never be certain that the disease is not also present and unrecognized in the corpus uteri.

Indications for Hysterectomy. Hysterectomy is indicated if the carcinoma is limited to the uterus; such limitation may be inferred if:

1. The uterus is normally mobile and symmetrical.
2. The uterus is not excessively enlarged.
3. The iliac and lumbar lymphatic glands are not enlarged; this is difficult to determine.
4. The vaginal wall is not involved in carcinoma.

The reverse of the above conditions contraindicates hysterectomy, and the stronger the reverse the stronger the contraindication.

Enlargement of the glands, although evidence that the carcinoma has extended beyond the uterus, does not necessarily contraindicate hysterectomy, although it renders the prognosis less favorable. If the glands are enlarged, a radical operation should include the removal of them.

The relations of the glands to the carcinomatous uterus offers a close analogy to the relations of the axillary and subclavian glands to cancer of the breast. Extension of cancer to the vaginal walls, if slight, does not definitely contraindicate hysterectomy, provided the diseased portion of the vagina can be removed together with the uterus. Extensive involvement of the vagina and fixation of the uterus in surrounding cancer contraindicate the operation.

When the disease has passed beyond the hope of radical cure, but not beyond the limits of palliative hysterectomy, hysterectomy is sometimes performed for the temporary relief of symptoms; the benefits, however, are not usually sufficient to overbalance the dangers. The removal of a carcinomatous cervix by the galvano-cautery as a radical operation is usually inadequate; as a palliative measure in advanced carcinoma it may furnish temporary relief.

VAGINAL HYSTERECTOMY.

The vaginal route for the removal of the carcinomatous uterus is usually preferred. Two methods of hæmostasis are in use: first, by forcipressure;[1] second, by ligature.

Vaginal Hysterectomy with Hæmostasis by Forcipressure.

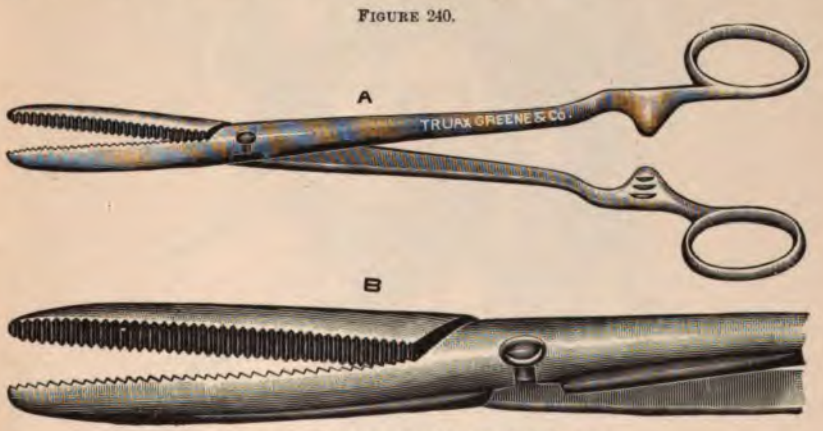
The technique of the operation with hæmostasis by forcipressure is as follows: The patient is placed in the lithotomy position, and the vagina disinfected. See Chapter II. Any cancerous disease around the external os should be scraped off with the curette or burnt off with the actual cautery, the cervix plugged with a small strip of gauze, and the os uteri closed with one or more sutures. This will confine the uterine secretions and keep them away from the peritoneum and field of operation, and is a most important precaution, for contact of cancer tissue with the wound has resulted often in transplantation of the disease and new infection. The author has observed a beginning

[1] Péan: Gazette des Hôpitaux, Paris, 1888. Leçons de Clinique Chirurgical de l'Hôpital St. Louis, tom. i., ii., iv., v. Richelot: L'Union Médicale, 3d series, vol. xlii. pp. 85-91; Paris, 1886, Ibid., p. 274; Paris, February 19, 1880. Secheyron: Report of the Academy of Medicine, Paris, 1887. Terrier, F.: Revue de Chirurgie, Paris, 1888. E. C. Dudley: Transactions American Gynecological Society, 1888, vol. xiii.

cancer on the abraded perineum three weeks after hysterectomy; this was excised thoroughly at once and the wound closed by perineorrhaphy, and the patient was free from cancer three years later. After closing the os externum the vagina should again be disinfected, the cervix exposed with one or two Simon's retractors, and seized with strong vulsellum forceps and drawn toward the vulva. At this point the vaginal tissue around the cervix should carefully be inspected, because the permanency of the result, especially in cervical cancer, will often depend upon the removal with the uterus of a considerable portion of adjacent vaginal tissue.

A free incision with the scissors is now made all around the cervix at a safe distance from the disease. The loose tissues around the cervix are easily stripped back by means of the finger or handle of the scalpel, keeping as close to the uterus as the disease will permit. Small bleeding-points are controlled by catgut ligatures. In this way the circumuterine structures may be stripped back from the uterus

FIGURE 240.



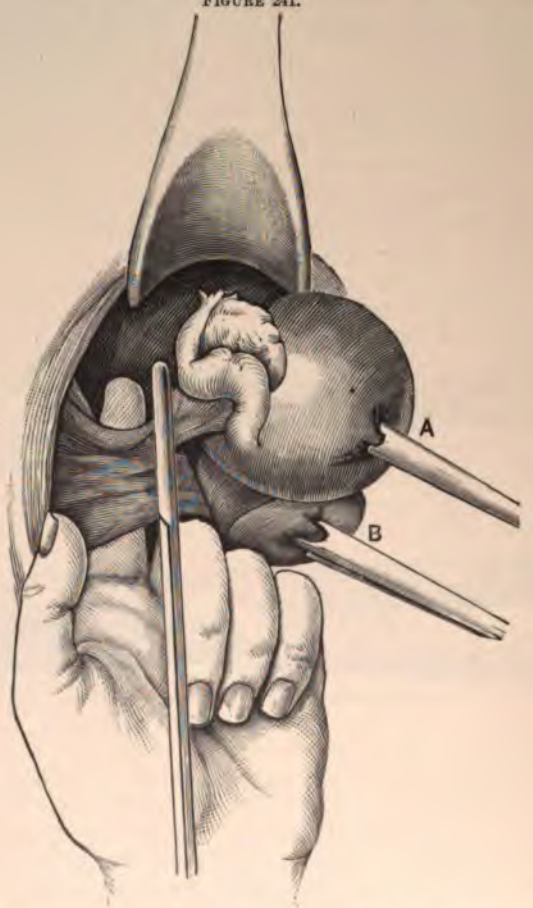
Forceps for clamping the broad ligaments.

until the exposed part of the cervix is measured by a zone three-quarters of an inch or more wide. This zone extends anteriorly and posteriorly to the anterior and posterior utero-peritoneal reflections, and laterally to the broad ligament. The uterus can now be drawn down much lower, and, with the bladder thus separated from the uterus, the ureters, which lie close to the uterus, can easily be avoided. The post-cervical structures are now further separated by means of the finger or the handle of the scalpel, or the closed blunt scissors, until the cul-de-sac of Douglas is opened. This opening is enlarged easily by introducing the two index-fingers and tearing laterally to the region of the broad ligaments. A large gauze sponge, with a string attached to facilitate removal, is now forced through into the cul-de-sac of Douglas. This will protect the pelvic viscera and absorb blood during the remainder of the operation.

The peritoneal edge of the post-uterine wound may now be united to the vaginal edge by means of a continuous catgut suture. A like

opening anterior to the uterus between the uterus and bladder is also made into the peritoneal cavity. As was done posteriorly, this opening is enlarged to the region of the broad ligaments by lateral tearing with the index-fingers, and the peritoneal edge of it, if the operator so elect, stitched to the vaginal edge. The whip-stitch by which this is done anteriorly and posteriorly reduces the size of the wound, pre-

FIGURE 241.

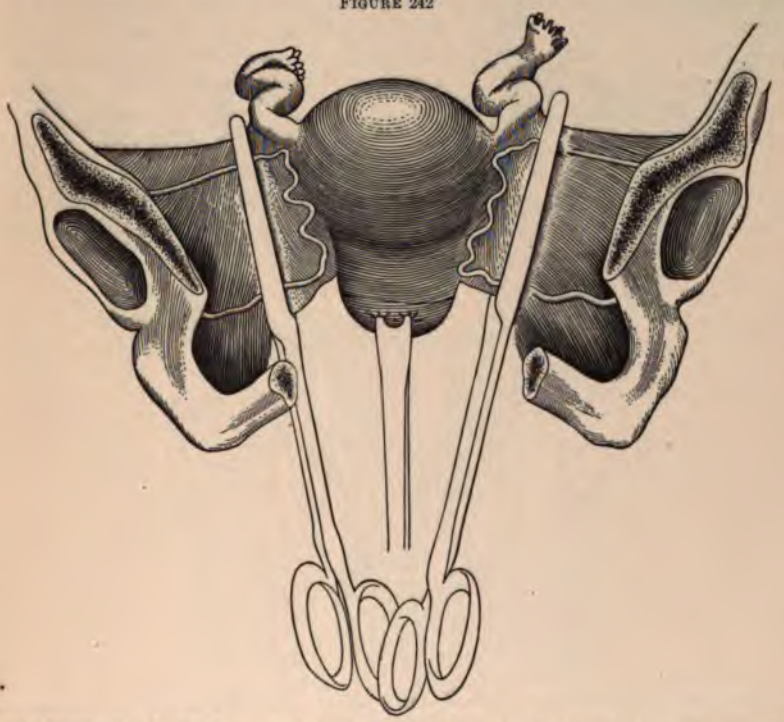


Uterus anteverted and corpus drawn through into vagina; right broad ligament being drawn down by index-finger and clamped by forceps. A. Corpus uteri. B. Cervix uteri.

vents bleeding, and thereby simplifies the operation. The anterior opening may sometimes be more easily made by passing the index-finger through the posterior opening, and, if possible, hooking it over the broad ligament, so that it may serve in some degree as a guide, and thereby prevent the operator from wounding the bladder, ureters, or anterior uterine wall. Then the index-finger of the left hand or a blunt hook is hooked over the left broad ligament, the ligament is drawn

down and seized with hæmostatic forceps, the grasp being at a sufficient distance from the uterus to prevent the instruments from slipping off after the organ has been severed. These forceps are constructed on the principle of Péan, but should be heavier and with jaws about two inches long. Various broad ligament clamps have been devised, but

FIGURE 242



Broad ligament on both sides entirely in the grasp of forceps. In actual practice it is usual to clamp and sever the left ligament first, and then the right.

none fulfils the indication better than the straight, strong hæmostatic forceps. The forceps' handles are securely locked, the ligament is severed close to the uterus, and the whole uterus pulled outside. The organ now hangs by the other broad ligament. This in turn is clamped in the same way, and the uterus is removed by a few strokes of the scissors. The ovaries and Fallopian tubes, unless already included with the broad ligaments, may be secured by separate forceps. If, upon examination, the operator fears that the broad ligament is diseased beyond the grasp of the forceps, he may put on other forceps back of those first applied. The first forceps may then be removed and the suspected tissues cut away. Fatal hemorrhage has resulted from the slipping of the broad ligament forceps; hence the necessity of so making the incision through the ligament as to leave considerable tissue on the distal side of their jaws. *To prevent the forceps handles from snapping apart, they should be tied together securely with strong thread.*

In many cases the uterus is much enlarged, and the ligaments therefore on either side extend so high in the pelvis that they cannot be drawn down within the grasp of a single pair of forceps. Then one pair of forceps may be put on, and that part of the ligament which is in their grasp divided. The uterus can then be drawn

FIGURE 243.

Two broad ligament forceps on each side in place. Ligament severed on one side and [illegible] on the other. The forceps handles should be tied together with strong silk, to [illegible] from snapping apart.

[illegible] down, and the remaining portion of the ligament, having [illegible] by one or more forceps, may be severed. If so much [illegible] is occupied by forceps as to impede the operator, [illegible] may be applied back of two or more, and the latter [illegible]. Some operators leave the vaginal wound open for [illegible] without gauze packing. If no packing is used, the [illegible] of the wound usually fall together and promptly [illegible], however, of annoying intestinal adhesions, [illegible], fecal fistula, intestinal obstruction, and peri- [illegible] of this practice. The wound may be closed [illegible] interrupted catgut suture. If drainage is re- [illegible] twisted gauze or a rubber tube, or both, may [illegible] sutures precisely as would be done in closing [illegible] vagina is then lightly packed with gauze, an [illegible] upon the vulva by a T-bandage, and changed [illegible] dry.

Whenever practicable the broad ligament stumps should be drawn down into the vagina and fixed there by catgut sutures, so that everything included in the bite of the forceps may be in the vagina. The advantage of this is twofold: 1. All traumatisms, save the simple peritoneal wound, are excluded from the peritoneum. 2. The ligaments, when united to the upper end of the vagina, support the pelvic floor, and with it the rectum, bladder, and vagina, so that enterocele vaginalis is prevented. See Figure 244.

Rectovaginal and vesicovaginal fistulæ are among the accidents of vaginal hysterectomy. Should either of these accidents occur in uniting the peritoneal edges to the vaginal edges of the wound anterior and posterior to the uterus by the whip-stitch already described, it is only necessary to use additional interrupted sutures at the point of the fistula. These sutures should not be buried, but should include the peritoneal and vaginal margins. The strong ten-

FIGURE 244.

Ends of broad ligament stumps fixed by forceps and sutures in the ends of vaginal wound. Sutures alone are sometimes used. Some of the sutures are shown as tied and others not yet tied.

dency of peritoneal surfaces to adhere to any exposed surface renders union almost certain.

Vaginal Hysterectomy with Hæmostasis by Ligature.

Hæmostasis by ligature is the same in general technique as that by forceps, save the use of ligatures in place of forceps. After the

Explanation of Plate IX.

A. Vaginal hysterectomy. The patient in the dorsal position.

The vagina and cervix uteri are exposed by retractors in the hands of assistants.

The os uteri externum has been closed by a continuous suture, to protect the operation wound and the peritoneum from the uterine secretions.

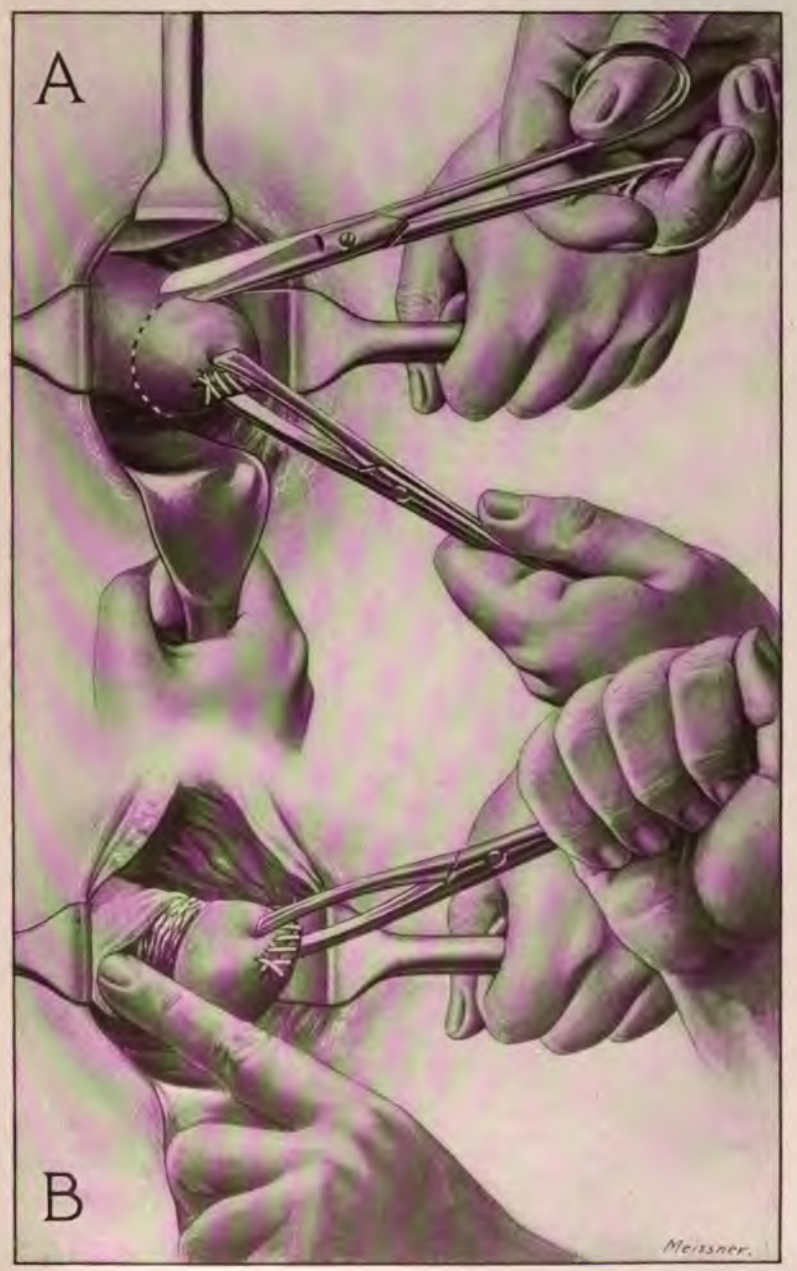
The cervix uteri has been seized by strong flat vulsellum forceps in the left hand of the operator and drawn strongly down toward the vulva.

The operator, with scissors in his right hand, is making a free incision through the mucosa all around the cervix uteri in the line of the utero-vaginal attachment. The black and white dotted lines indicate the direction of the incision.

The bleeding points are secured by fine catgut ligatures—not shown.

B. The mucosa all around the uterus has been divided by scissors. While strong traction is being made on the uterus by the forceps in the right hand of the operator, the left index finger is used to strip back the circumuterine tissue all around the cervix. The stripping process is continued until it has exposed a zone of raw tissue an inch or more wide, when the utero-peritoneal reflexion will be recognized by the loose, thin, membranous character of the tissue, and by the fact that under the finger it slips over the adjacent peritoneal covering of the uterus.

PLATE IX.



Explanation of Plate X.

Vaginal hysterectomy. The patient in the dorsal position.

The vagina and cervix uteri are exposed by retractors in the hands of assistants.

The os uteri externum has been closed by a continuous suture to protect the operation wound and the peritoneum from the uterine secretions.

The cervix uteri has been seized by strong flat vulsellum forceps in the left hand of the operator and drawn strongly down toward the vulva.

A. The circumuterine structures have been stripped down to the utero-peritoneal fold, as shown in Plate IX.; the operator seizes this fold posterior to the uterus with a hæmostatic forceps in the left hand, and with scissors in the right hand cuts through into the cul-de-sac of Douglas.

B. The operator, with the index fingers inserted into the cul-de-sac of Douglas through the opening shown in *A*, is tearing laterally to the region of the broad ligaments.

A similar incision is then made into the pelvic cavity anterior to the uterus, and enlarged by lateral tearing to the region of the broad ligaments in the manner described above, so that the uterus is attached to its surroundings by only the broad ligaments.

Explanation of Plate XI.

Vaginal Hysterectomy. The patient in the dorsal position.

The vagina and cervix uteri are exposed by retractors in the hands of assistants.

The os uteri externum has been closed by a continuous suture to protect the operation wound and the peritoneum from the uterine secretions.

The cervix uteri has been seized by strong flat vulsellum forceps in the left hand of the operator and drawn strongly down toward the vulva.

The uterus has been freed from its surroundings anteriorly and posteriorly as described in Plates IX. and X.

A. While the uterus is drawn strongly downward and to one side with vulsellum forceps in the hand of an assistant, the operator introduces the left index finger through the posterior vaginal opening in the cul-de-sac of Douglas and brings the [illegible] out into the vagina through the anterior opening, so as to hook it over the [illegible] broad ligament; the ligament thus held on the finger is transfixed at two points by a threaded needle passed blunt end first. A needle passed in this manner is a convenient substitute for the needle with the eye in the point shown in *D*.

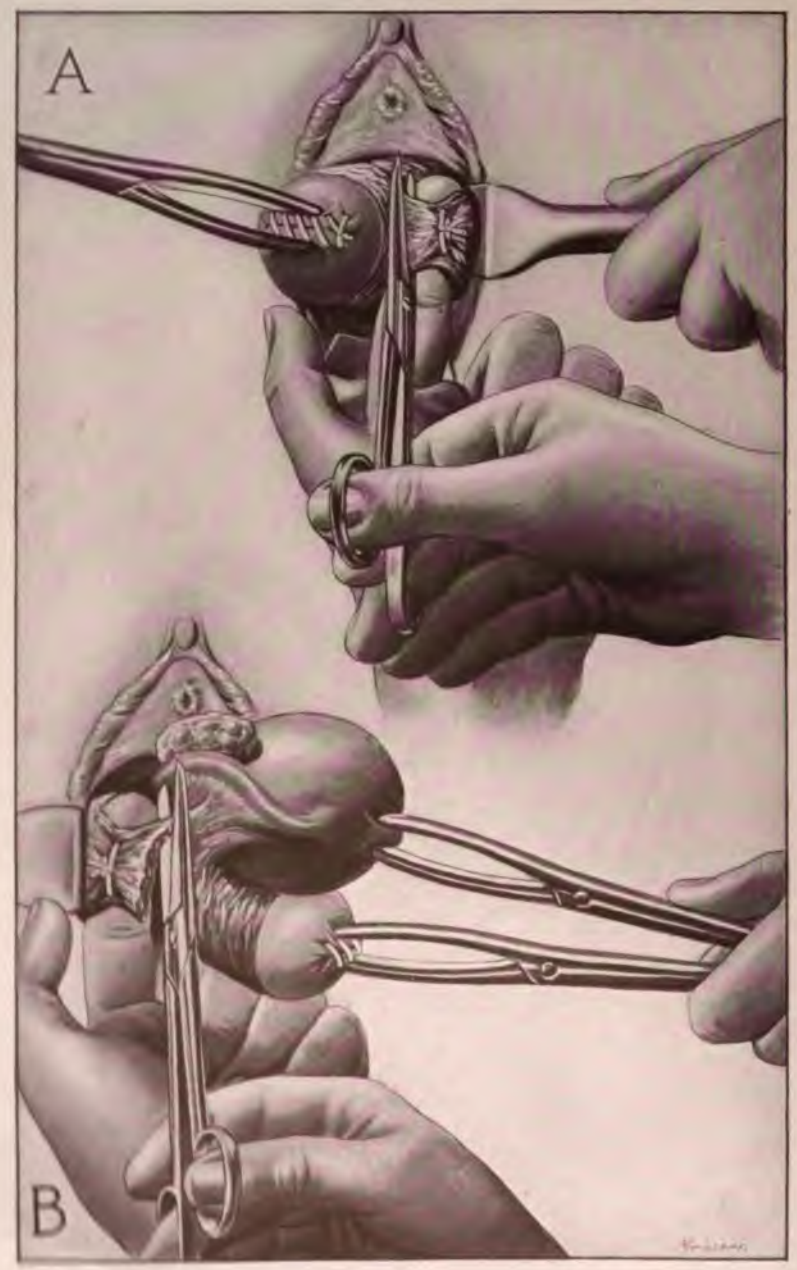
B. The needle has been drawn through the broad ligament, leaving the ligature in place ready to be tied.

C. The ligature has been tightly tied and is being secured against possible slipping by an additional stitch on the proximal side of it; the entire ligature when tied is shown in Plate XII., *A*. Observe that the ligature does not compress the entire ligament, but leaves out a margin on the upper and lower border, so that collateral circulation may continue to supply and keep alive the distal portion of the stump; this prevents gangrene and sloughing of the stump, and is therefore *a very essential feature* [illegible]

D. Shows the form of needle in general use for ligature of the broad ligament. The [illegible] of an ordinary needle passed by a needle-forceps, blunt end first, is more [illegible], and because any size, curve, or form of needle may be used at a constantly [illegible] angle to the forceps, is more practical.

PLATE XI.

PLATE XII.



Explanation of Plate XII.

Vaginal Hysterectomy. The patient in the dorsal position.

The vagina and cervix uteri are exposed by retractors in the hands of assistants.

The os uteri externum has been closed by a continuous suture to protect the operation wound and the peritoneum from the uterine secretions.

A. The cervix uteri is drawn strongly downward and to one side by vulsellum forceps in the hand of an assistant; the left broad ligament having been ligatured en masse as shown in Plate XI., is exposed by the operator's left index finger and is cut from the uterus about one-half inch from the ligature with scissors in the operator's right hand.

B. The uterus having been freed from its attachment anteriorly, posteriorly, and on the left, is drawn outside, and the corpus is seized with another pair of forceps; these forceps, together with those on the cervix, are placed in the hand of an assistant, who makes traction on them, thus pulling the doubled uterus strongly downward and to one side, while the operator ligatures en masse and severs the right broad ligament in a manner precisely similar to that already described for tying and cutting the left; the uterus having thus been removed, the vaginal wound is closed by interrupted or running catgut sutures, as shown in Figure 244 and Plate XIV. These sutures may secure both the peritoneal and vaginal margins of the wound or only the peritoneal margins; in either case they should so include the ligatured stumps of the broad ligaments as to fix them in the wound where they may give normal support to the rectum, vagina, and bladder. If drainage is required, the wound should be left partially or wholly open for that purpose. The central third of the wound, if not sutured, will usually suffice for drainage. The gauze drain is commonly preferred.

Explanation of Plate XIII.

In the majority of cases it is impractical to include the entire broad ligament in a single ligature, and it is therefore necessary to tie it in parts; this is called progressive ligature of the broad ligament.

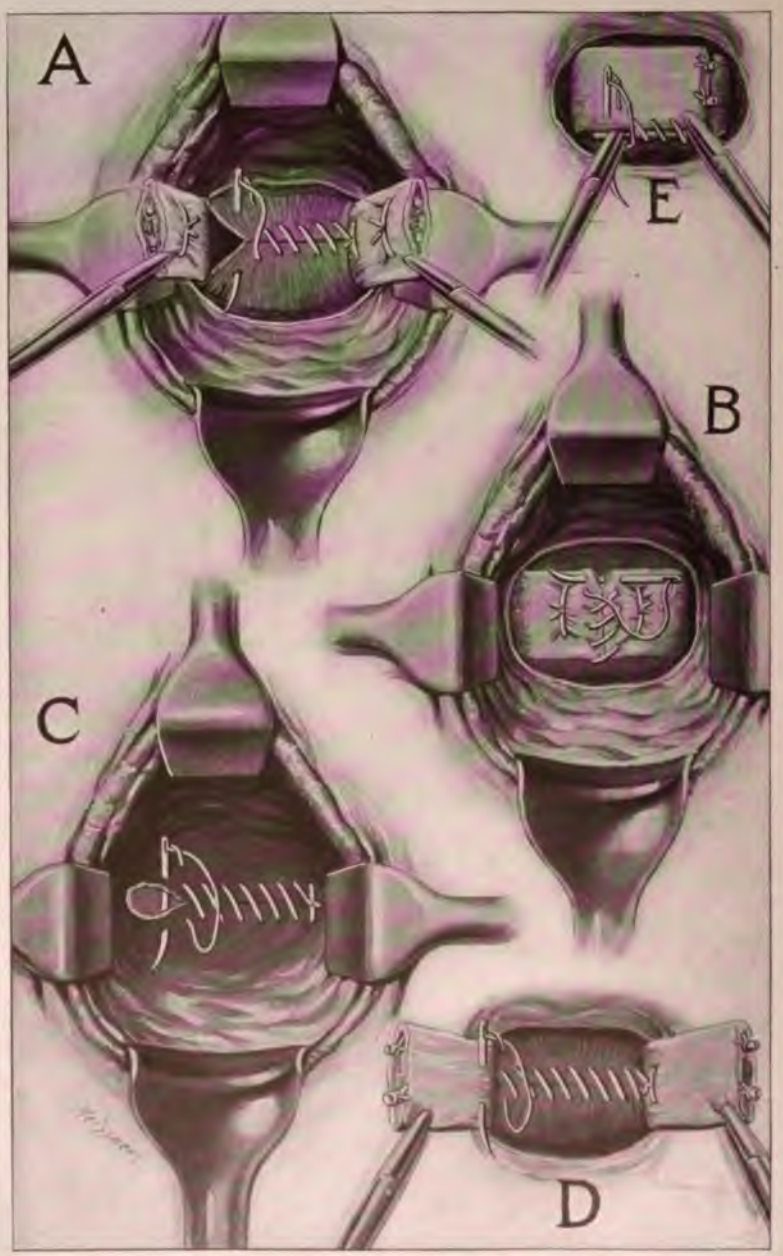
A shows the broad ligament being progressively tied from the lower to the upper margin; the first ligature is being introduced on the lower margin. As each ligature is introduced, the ligatured portion is cut until the entire ligament is severed from the uterus.

B. In some cases the ligament is too inaccessible for progressive ligature from the lower to the upper margin; then the corpus uteri may be delivered through the anterior vaginal wound and drawn by strong forceps to the vulva, so as to twist the ligament on itself and thereby reduce the size of it and render it accessible for progressive ligature from the upper to the lower border; the beginning of such a ligature is here shown.

C. In some cases the ligaments are inaccessible for ligature in the manners described under *A* and *B*. The uterus may then be seized by two strong forceps, one on either side of the cervix, drawn strongly toward the vulva, bisected with scissors in the median line of the longitudinal axis, and each half drawn outside; the ligaments may then be ligatured and the uterus thus removed in two parts.

PLATE XIII.

PLATE XIV.



Explanation of Plate XIV.[1]

In most cases the ligatured stumps of the broad ligaments can be drawn down into the vagina. In such cases the usual method has been to fasten them by sutures at each end of the closed vaginal wound, in such a way that the ligatured stumps shall be in the vagina below the level of the vaginal wound. The ligatures are applied by many operators *en masse* around the entire ligaments in such a way that the ligatured portion will slough. It is, however, better to apply the ligatures so that no sloughing can occur; that is, to let the ligatures include only that portion of the ligament through which the arteries pass. This plate shows a very practical method of treating the ligatured ends of the broad ligaments in such a manner as to avoid sloughing of the ligatured stumps and to fix them in the vaginal wound. The method here illustrated is applicable only to those cases in which the ligaments are sufficiently long to permit either end-to-end approximation or the folding of one upon the other and the fixation of them in the vaginal wound between the vaginal and peritoneal sides of it.

A. The ligaments having been ligatured *en masse* in such a manner as to avoid sloughing of the ligatured stumps, are drawn down into the vagina by means of pressure-forceps. The anterior peritoneal margin of the vaginal wound is being united to the posterior margin by a continuous catgut suture. At both ends of the line of union this continuous suture secures the broad ligaments, so that they cannot slip back into the pelvic cavity. Only one ligature is here shown on each broad ligament. In the majority of cases more than one ligature may be required.

B. The anterior and posterior peritoneal margins having been united, as shown in *A*, the broad ligaments are brought together by end-to-end approximation and united by a continuous catgut suture. The united ends of the broad ligaments are now in contact with, and in front of, the united peritoneal margins, as shown in *A*.

C. The anterior and posterior margins of the peritoneal wound have been united, and the broad ligaments have been approximated end-to-end by continuous sutures, as shown in *A* and *B*. The anterior and posterior margins of the vaginal mucosa are being united by a continuous catgut suture, making a line of union from side to side. This suture completes the operation.

D. In some cases the broad ligaments are so long that instead of uniting them end-to-end they may be folded one upon the other, and so fastened together. The anterior and posterior peritoneal margins have been united in precisely the same manner, as shown in *A*.

E. The anterior and posterior peritoneal margins of the vaginal wound have been united by a transverse line of union, as shown in *A* and *D*. The ends of the broad ligaments have been folded upon themselves, and are being united by a continuous catgut suture along the lower borders of them. A similar suture is to be introduced along the upper borders. The ligaments having thus been united, are to be covered by union of the upper and lower margins of the vaginal mucosa, as shown in *C*.

The method of fixing the ends of the broad ligaments between the peritoneal and vaginal sides of the wound will be found, when practical, to have great value, for the ligaments so fixed can then perform the important function of holding the pelvic viscera high up in the pelvis and of preventing prolapse of the pelvic floor (rectum, vagina, and bladder), a not uncommon and most unfortunate result of vaginal hysterectomy when performed by the older methods.

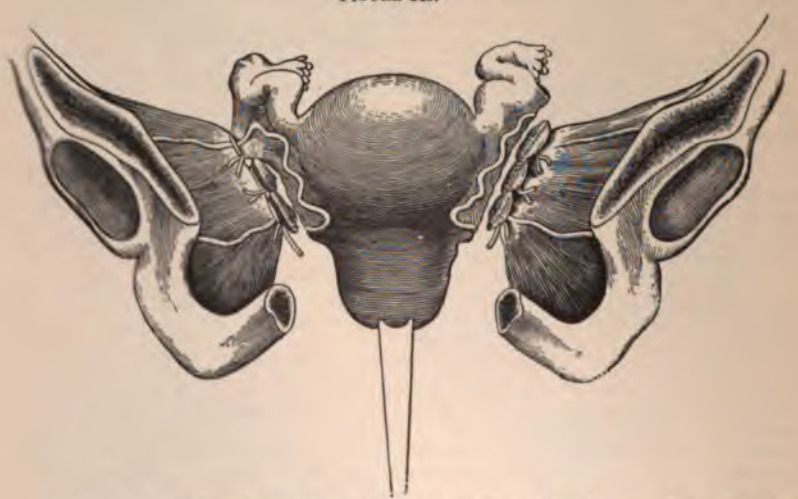
In vaginal hysterectomy for carcinoma the broad ligaments will frequently be sufficiently long to permit end-to-end approximation, but they will not, in most cases, permit overlapping, as illustrated in *D* and *E*. The method of overlapping the ligaments, however, will always be possible in the operation of vaginal hysterectomy when performed for complete procidentia uteri, and is strongly urged in that class of cases; when the ligaments are not sufficiently long for end-to-end approximation, they may be fixed in the vaginal wound, as described in the text, or if not sufficiently long for this, may have to be returned to the pelvic cavity. See close of Chapter XLV.

Observe in *E* and *D* the isolated ligature of the arteries. This form of ligature will usually be quite practical except for very short and very large ligaments, and when practical, should always be employed, because it insures normal circulation in the stumps and is an absolute safeguard against sloughing. It should, however, be remembered that in hysterectomy for cancer there is a decided advantage in removing as much of the ligament as possible; hence, the ligature *en masse* in such cases may be preferable.

[1] Journal American Medical Association.

anterior and posterior openings already described have been made, and the broad ligaments have been isolated, each ligament may be transfixed and tied *en masse*, or, if very large, in sections. The application of the ligatures may be facilitated by anteverting the uterus and drawing the corpus through the anterior opening by means of vulsellum forceps. This twists the ligaments upon themselves, makes them smaller, and brings their upper margins within reach. Separate ligatures usually are needed for the uterine appendages. The six accompanying plates will show the technique of the operation. Each ligament usually is ligatured in two or three sections. The ligatures — preferably catgut — are passed by means of aneurism needles, or with the ordinary threaded needle and forceps. In some cases an entire ligament may be secured by a single ligature, but more frequently portions of it on either side are

FIGURE 245.



Broad ligaments secured by three *en masse* ligatures on each side. Ligament severed on left side and partly severed on right.

tied progressively and cut away from the uterus until the organ finally is removed. In many cases hysterectomy is facilitated by dividing the uterus into two halves. Each half may then be drawn through the vagina separately and removed. The ends of the ligatures, having been left long, are now used to draw the stumps down into the vaginal wound, where, as in the forcipressure operation, they are fixed not by forceps but by the sutures which are used in the closure of the wound. The ligatures are now cut short. If the stumps will not reach to the vagina, the ligatures are cut short, and the stumps returned to the pelvic cavity. Sometimes all the stumps are too short, and therefore must be treated intraperitoneally. The vaginal wound will then be treated as the conditions may require, with or without the gauze drain. See Chapter VII., on Drainage.

After-treatment. The general procedure in after-treatment differs in nothing from that of ordinary abdominal section. The forceps and

vaginal gauze and the drain, if there be one, should be removed at the end of forty-eight hours, and a one-half of 1 per cent. lysol douche given. If the wound has been left open and packed with gauze, great care should be used lest in its removal a loop of intestines be drawn into the vagina. The douche may be repeated daily, or, if the discharges are fetid, oftener. Let the douche be a weak current, lest it force its way through the fresh adhesions into the general peritoneum.

Relative Merits of the Ligature and Forceps Operation.

The advantage of pressure forceps over the ligature are: 1. The greater facility of application very materially shortens the operation; therefore in a difficult case, with inaccessible broad ligaments, they are safer. 2. The forceps may be made to grasp a considerable portion of the broad ligament; the ligament may be drawn down and grasped further back by other forceps; more of the ligament may in this way be included than would be possible with the ligature. Whatever the forceps grasp will slough; by this means a very large portion of the ligament may be destroyed. Some part of the disease which the ligature might have missed may therefore be removed with the slough. 3. The forceps facilitate drainage. The secretions find their way out along the solid instrument by continuity of surface. 4. If the forceps are properly constructed and applied, the security against secondary hemorrhage is very great.

The disadvantages of the forceps as compared with the ligature are: 1. They cause great suffering to the patient. 2. Their removal is painful. 3. Convalescence is apt to be more protracted and complicated.

Both the ligature and the forcipressure operations are efficient and satisfactory; therefore, whichever is most convenient or will most facilitate the operation should be used. The forceps will always be preferable in grave cases, especially when the ligaments are very thick and inaccessible. Ofttimes both methods will be useful in the same case.

Combined Operation of Abdominal and Vaginal Section.

When the vulva and vagina are small and the uterus is large, high in the pelvis, or fixed, its removal through the vagina will be very difficult. Under these conditions, after making the vaginal incisions and separating the cervix from its surroundings, as already described, the operation may be better finished through an abdominal opening. The technique is the same as that described for hysteromyomectomy.

Mortality of Hysterectomy for Cancer.

In properly selected cases—see Indications for Hysterectomy—the mortality of vaginal hysterectomy for cancer is small. In one series

of more than fifty consecutive cases the author had no death. Out of ten combined operations in which the abdomen also was opened he had two deaths.

Recurrence of Carcinoma after Hysterectomy.

The recurrence of cancer after hysterectomy is less frequent than after the removal of cancer from other parts of the body. Even in cancer of the breast, where by reason of the exposed position of the growth the diagnosis is usually made earlier than in the uterus, recurrence is much more frequent. This is true notwithstanding the common practice of thorough removal of the subclavian and axillary glands in connection with breast operations, and notwithstanding the fact that in the usual hysterectomy the parametric glands are seldom removed. The statistics of the best operators show freedom from the disease two or more years after vaginal hysterectomy in from about 40 to 60 per cent. of all cases.[1]

In order to prevent recurrence of the disease the usual rule for the removal of cancer in other regions applies—*i. e.*, complete removal of all the apparently diseased tissue and of as wide a margin of adjacent tissue as safety will permit. This rule is based upon the invariable tendency of cancer to follow the vessels, especially the lymph vessels, into the surrounding structures.

More Radical Operations of Hysterectomy.

More radical operations for the further prevention of recurrence, have, though thus far with little encouragement, been proposed, viz., the removal of all peri-uterine and lumbar glands[2] and the excision of the broad ligaments close to their pelvic attachments.[3] Both of these procedures require coeliotomy and greatly increase the traumatism. The removal of the broad ligaments involves the following steps: 1. The uterine artery on each side must be dissected out beyond its vaginal branch, and tied. 2. The ureters must be dissected free from the base of the broad ligaments. 3. To avoid wounding the ureters they must each contain a bougie passed through the urethral speculum. The increased traumatism, great difficulty of technique, and, above all, the time required would probably increase the mortality of the operation enough to offset any possible advantage. The difficulty and danger of the removal of broad ligaments and all the lymphatic glands in connection with the hysterectomy for cancer, will be apparent from examination of Figure 246 and of the Frontispiece.

Palliative Treatment.

When cancer has extended to the bladder or rectum, or has materially involved the vagina or parametria, and especially when the uterus

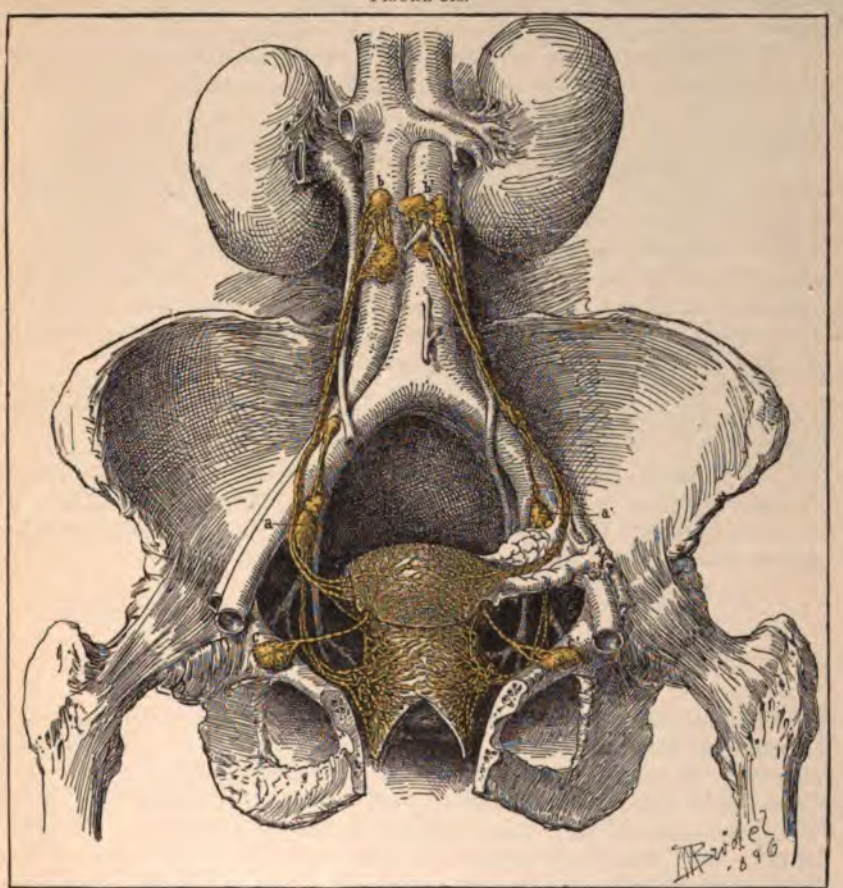
[1] American Text-book of Gynecology.

[2] Ries. Modern Treatment of Cancer of the Uterus. Chicago Medical Recorder, November, 1897.

[3] J. G. Clark. Johns Hopkins Bulletin, xii., xiii., July and August, 1896.

is fixed, hysterectomy is extra-dangerous and useless. Unfortunately, the onset of the disease is so insidious that the early symptoms of pain, hemorrhage, and watery discharge are overlooked or are attributed to other causes; hence the diagnosis is not usually made until too late for hysterectomy; then palliative treatment can hold out

FIGURE 246.



Lymphatics of uterus and upper third of vagina, and iliac and lumbar glands.

at best only relief from suffering during the few months of remaining life. Palliative treatment is both local and systemic.

The object of local treatment is to check the exhausting hemorrhages and discharges. This is accomplished best by sharp curettage of the more superficial, soft, ulcerating portion of the cancerous growth. Remember that the disease may extend through the vesical, rectal, or uterine walls, and that, without care, the bladder, bowel, or peritoneum may be opened. The redundant cancerous mass having been removed, the surface thus exposed should be seared over with the

[1] After W. W. Russell, in American Journal of Obstetrics.

Paquelin or galvanic cautery, or cauterized with nitric acid or with an 8 per cent. solution of chromic acid.

The cancerous growth may be kept down and the fetid discharges at the same time deodorized by the application every three or four days of a saturated solution of iodine crystals in pure carbolic acid. This application is best made on small tampons. The healthy parts of the vagina may be protected by covering the mucosa with gauze pads.

Deodorizing douches are useful to destroy the nauseating fetor of the discharges. Among the best of these are peroxide of hydrogen, a 2 per cent. solution of potassium permanganate, a weak solution of formalin, or liquor sodæ chlorinatæ, one part to ten parts of water.

The hemorrhage is best controlled by the curette and cauterization, already described. A sudden profuse hemorrhage may be checked by a douche of hot water, hot vinegar, or hot alum solution. Should the vaginal tampon be used, it will become intolerably offensive, and should therefore be removed in twenty-four hours. The erosion and excoriations of the external genitals and nates, which are caused by the ichorous discharges from above, may be relieved by frequent bathing and by the application of benzoated zinc oxide ointment.

The general treatment includes regulation of the bowels and kidneys, tonics, nutritious food, mild exercise, and massage. Pain is a clear indication for morphine or opium. Life will be limited to a few months; hence the danger of the opium habit is not significant. Numerous drugs, both for local and systemic use, have been lauded as cancer cures; they are, so far as their merits have been investigated, useless.

ENDOTHELIOMA.

Pathology, Diagnosis, and Treatment.

Endothelioma is a malignant new formation arising from the endothelium of bloodvessels, or of lymph-vessels, or of serous surfaces; it closely resembles carcinoma in gross appearance and clinical manifestations. The entire lumen of the vessels is distended with proliferating endothelium, which assumes a variety of shapes. The cells usually form nests and strands similar to those of carcinoma. The diagnostic point is the origin, as stated above. The diagnosis can only be made by microscopic examination. The growth is found in the cervix and corpus uteri, and very rarely also in the ovary, Fallopian tube, and vagina. The treatment is the same as that of other malignant disease.

CHAPTER XXIX.

TUMORS OF THE UTERUS (CONTINUED).

SARCOMA.

SARCOMA is a malignant tumor belonging to the connective-tissue group. As compared with carcinoma, it is of rare occurrence. The disease, which may appear at any time during the age of sexual maturity, has been observed as late as the age of seventy. Like cancer, it is more frequent at about the period of the menopause—that is, between forty and sixty.

Histogenesis of Sarcoma.

Sarcoma may develop from any of the following sources: 1, the interglandular connective tissue of the endometrium; 2, the intermuscular connective tissue of the myometrium; 3, the walls of the blood-vessels; 4, the perivascular connective tissue; 5, the muscle cells;[1] 6, any of the structures of a uterine myoma.

Pathological Anatomy of Sarcoma.

Three well-defined clinical forms have been described:

a. Fibrosarcoma.
b. Diffuse sarcoma.
c. Butryoides—grape-like sarcoma.

a. **Fibrosarcoma**, often called interstitial sarcoma, is the form that develops in the intermuscular connective tissue. It is also frequently the result of the so-called sarcomatous degeneration of a myoma. Like myoma, the growth may be submucous, intramural, or subserous; its form and consistency are variable—*i. e.*, round, oblong, or irregular, soft, or hard. The disease may be circumscribed or diffuse. Its frequent origin from a myoma often gives it the appearance of that tumor—*i. e.*, of single or circumscribed nodules scattered throughout the uterus. The growth is rarely encapsulated, though usually well defined. The characteristic cells are round or spindle. The spindle cell more frequently predominates. These cells are often so elongated as to appear like fibrous tissue; hence the name fibrosarcoma.

b. **Diffuse Sarcoma** usually develops from the interglandular connective tissue of the endometrium. In this form the small round cell usually predominates over the spindle cell. The growth may be confined to separate areas, or may infiltrate the whole endometrium and

[1] Whitridge Williams. American Journal of Obstetrics, 1894, vol. xxix.

rapidly involve the entire uterus and adjacent organs. It develops both toward the endometrium and peritoneum. Intra-uterine sarcoma may take the form of numerous soft medullary polypi. When removed by the curette they have the gross appearance of carcinoma.

FIGURE 247.

Fibrosarcoma or spindle-cell sarcoma. Semi-diagrammatic.[1]

c. **Butryoides or Grape-like Sarcoma** is extremely rare, and usually originates in the cervix. It has the form of cyst-like masses resembling hydatid moles. The growth is composed mostly of round and spindle cells; it has been observed in the uteri of adult women and children, and in the vagina of children.[2] The development of this extremely malignant growth is most rapid.

Other varieties of cervical sarcoma are still more rare.

All sarcomata, especially the diffuse, are extremely vascular. The bloodvessels are sometimes so enormously dilated as to form cavernous spaces. The lymph spaces may dilate into cystic cavities.

Symptoms, Course, and Diagnosis of Sarcoma.

The symptoms and course vary with different forms of sarcoma.

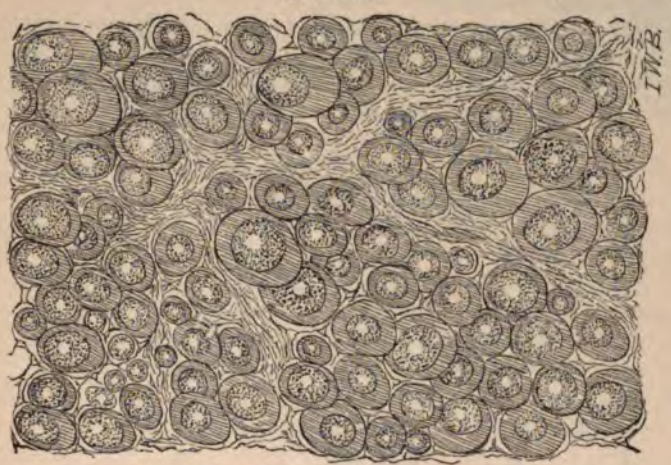
The interstitial spindle-cell sarcoma, formerly called recurring fibroid, is sometimes of slow growth. In exceptional cases it may not destroy life for several years.

The diffuse, small round-cell sarcoma, on the contrary, is ordi-

[1] American System of Gynecology.
[2] Peck. From Playfair's System of Gynecology.

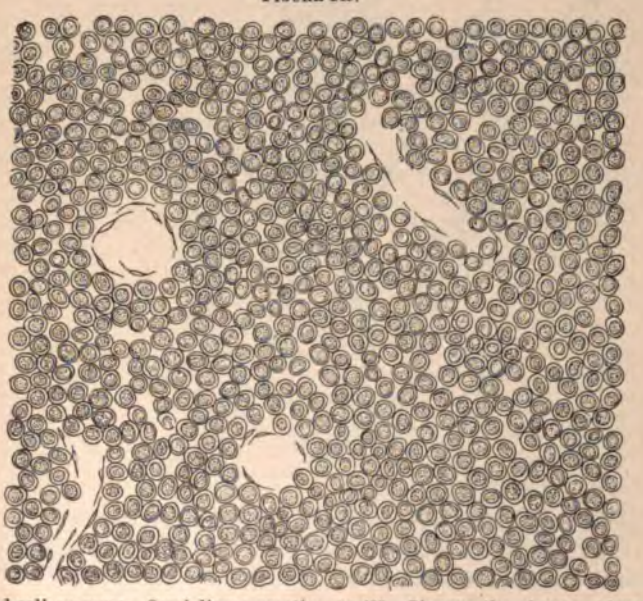
narily much more malignant than carcinoma; it often goes on to a fatal result in a few months. The small round-cell sarcoma is most

FIGURE 248.



Alveolar, large round-cell sarcoma. Semi-diagrammatic.[1]

FIGURE 249.



Small round-cell sarcoma. Semi-diagrammatic. × 400. Observe the absence of wall in the vessels, a condition characteristic of sarcoma.[2]

malignant, the large round-cell less malignant, and the spindle-cell least malignant.

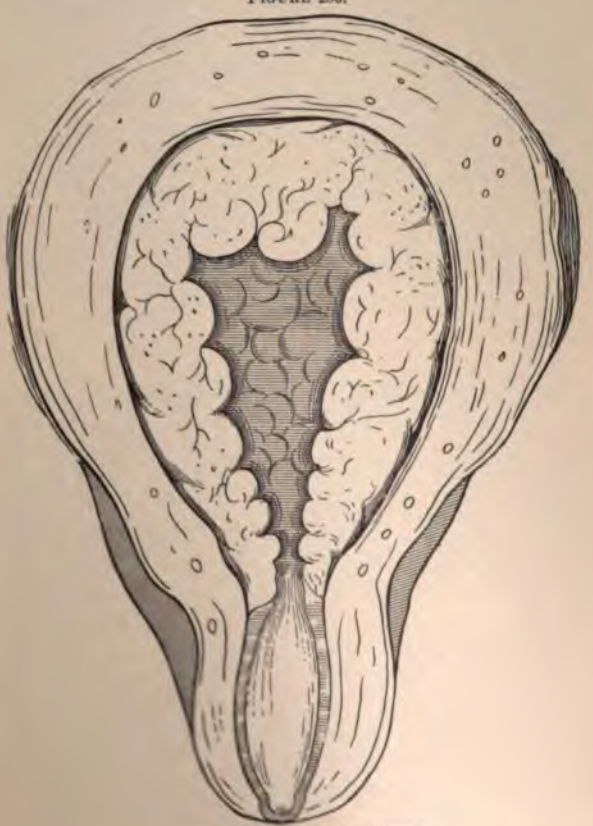
The tendency of sarcoma is to scatter its nodules through the

[1] American System of Gynecology, vol. ii. p. 227.

[2] Ibid., p. 231.

uterine walls, to penetrate the bloodvessels, to extend to the peritoneum, and to involve adjacent organs. The thickened, enlarged uterus, the bladder, and the neighboring intestines are then matted together in the sarcomatous disease and materially increase the size of the tumor. The disease is prone to send its emboli by the veins to the lungs, liver, kidney, spleen, and brain. These and other organs may now become rapidly involved in metastatic sarcoma. It is a peculiarity of the disease that emboli pass through the veins to dis-

FIGURE 250.



Sarcoma of the endometrium.

differs from carcinoma, which is apt
and to be arrested by thrombic plugging
original seat of the disease. The symp-
interstitial sarcoma in the beginning may
myoma as to make the clinical diagnosis
course and physical signs of this
almost identical with those of

Gynécologie.

Sarcomatous degeneration of a myoma (spindle-cell sarcoma) may be suspected:

1. When the hemorrhages formerly attributed to the myoma suddenly increase or, having ceased for a considerable time, begin again.
2. When after the onset of the menopause the tumor rapidly increases in size and becomes softer.
3. When the growth returns after removal.
4. When ascites suddenly occurs.
5. When cachexia suddenly appears.

When sarcoma takes the place of myoma the growth rapidly increases. Hitherto painless, it now causes intense suffering. Hemorrhages are increased and supplemented by watery, sanious discharges, which, after the onset of ulceration and gangrene, have an offensive odor. There is a facial expression of distress. The general depression is out of proportion to the anæmia and inanition. Pressure symptoms, cachexia, and emaciation are more and more pronounced, and of very rapid development. If the sarcoma becomes polypoid, the pain from uterine contractions is spasmodic, and hemorrhages are frequent and prolonged.

The clinical symptoms and course are substantially the same as those of carcinoma, but with the following distinct characteristics, especially in the round-cell varieties:

1. Ascites occurs earlier than in carcinoma.
2. Rectum and bladder symptoms not pronounced; these viscera not usually involved, as they are in carcinoma.
3. Cachexia earlier than in carcinoma.
4. Growth more rapid than in carcinoma.
5. Symptoms referable to matastasis more common because metastatic extension occurs much more frequently than in carcinoma.

Positive diagnosis is only possible by the microscope.

Treatment of Sarcoma.

The treatment may be either radical or palliative, and is the same as for carcinoma, viz., early hysterectomy, if possible. Unless all the disease can be removed, the operation hastens death, for it opens the venous channels, and thereby favors metastasis. Palliative hysterectomy—a questionable remedy in carcinoma—is therefore prohibited in sarcoma. The operation is performed the same as in cancer. See Hysterectomy for Cancer.

CHAPTER XXX.

TUMORS OF THE UTERUS (CONTINUED).

DECIDUOMA MALIGNUM.

Etiology.

DECIDUOMA malignum is confined to the physiological period of maturity, occurs usually between the ages of twenty and thirty-five, and in 43 per cent. of cases is preceded by hydatiform mole.

Pathology.

This disease, first described in 1889,[1] is the most malignant of all uterine tumors. The growth differs radically from all other neoplasms; the essential element is a large giant cell, Figure 251. This cell is imbedded in a kind of cellular tissue which resembles sarcoma, and which makes up the greater part of the growth. The presence of so much sarcoma-like substance has raised the question whether the disease is not essentially sarcoma. On the other hand, the tumor is epithelial,[2] "the tissue combining in the formation of it being: 1. Syncytium—*i. e.*, the uterine epithelial layer of the chorion. 2. The so-called cellular layer—layer of Langhans—*i. e.*, the ectodermal epithelial layer of the chorion." The question has therefore also been raised whether the growth is not carcinoma. The classification, however, is *sub judice*. The disease has been variously designated, according to the point of view, as *syncytioma*, *sarcoma*, *deciduo cellulare*, and *scrotinal tumor*.

Deciduoma malignum is more or less circumscribed, reddish brown, and friable; it presents secondary nodules, and commonly extends by early metastasis to the vagina, ovaries, broad ligaments, spleen, kidney, and brain.

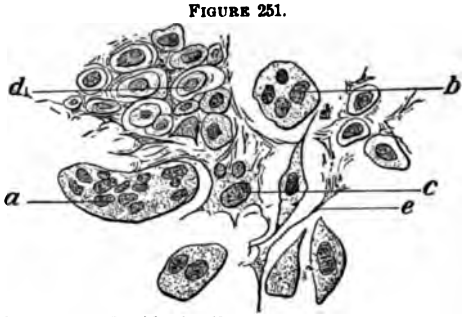
The growth is rich in blood-supply,[3] and the blood is confined within irregular spaces; the vessels have no walls; hence the frequent hemorrhages. Necrotic changes take place early. Under the necrosed tissue is solid tumor, and under this is normal uterine tissue. In the development of the growth the normal constituents of the uterine wall are replaced rapidly by invasion of giant cells and small, round cells.

[1] Sänger. A System of Gynecology, by Playfair.
[2] Marchand. From Playfair's System of Gynecology.
[3] H. M. Jones. A Clinical and Pathological Study of Deciduoma Malignum. Johns Hopkins Hospital Reports, vol. vi.

Symptoms and Diagnosis.

Profuse hemorrhage occurring after labor or abortion is the most characteristic symptom; it is intermittent and commonly so profuse as to cause profound anæmia. Curettage gives but transient relief. The discharge is profuse, watery, and often foul-smelling. Hydatid-like moles may be discharged with the hemorrhage. The uterus rapidly enlarges. Metastasis takes place by the venous route, most commonly to the lungs, and gives rise to symptoms referable to the newly infected part. Anæmia, emaciation, and cachexia follow in rapid succession. Even though the disease be removed by early hysterectomy, death in a few months is usual.

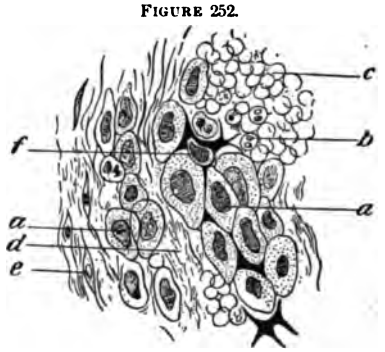
FIGURE 251.



Fragment of deciduoma. *a*. Decidual cell with thirteen nuclei. *b*. Same, with four nuclei. *c*. Giant cell in process of formation, with three nuclei. *d*. Uninuclear decidual cell enclosed in reticulated stroma. *e*. Reticulated stroma.[1]

Physical examination shows an enlarged uterus, movable or fixed by adhesion. Smooth, secondary nodules may be felt on the tubes.

FIGURE 252.



Fragments of deciduoma from same specimen as shown in Figure 225. *a*. Decidual cells. *b*. Leucocytes. *c*. Blood-corpuscles. *d*. Intermuscular cellular tissue. *e*. Fusiform cells. *f*. Reticulum.[2]

The uterine cavity may be sufficiently open to admit the finger. Digital exploration will then detect masses of soft tissue and coagula of blood usually localized in the uterine wall. The above history and symptoms are highly diagnostic. *Microscopic examination* of the scrapings will clear the diagnosis.

[1] Sänger, from Pozzi.

[2] Sänger, from Treatise on Gynecology, Pozzi.

Prognosis.

t per cent. of all cases terminate fatally within six
luoma malignum is the most malignant of all tumors.

Treatment.

Prophylaxis requires thorough removal of all retained products of conception and prompt attention to post-abortum and puerperal hemorrhages. The surgical treatment is the same as that already laid down for carcinoma, viz., early hysterecomy.

PLATE XV.

Solid Carcinoma of the Ovary, with Extension of the Disease to the Intestinal and Parietal Peritoneum and to the Omentum.

CHAPTER XXXI.

SOLID TUMORS OF THE OVARY.

Fibroma. Myoma. Sarcoma. Carcinoma. Benign Papilloma.

THESE tumors, like some ovarian cysts, may develop between the folds of the broad ligament. They are then called intraligamentous. Usually, however, solid ovarian tumors are pedunculated and lie entirely outside of the broad ligament. A pedicle connects the tumor with the uterus, and, as in ovarian cyst, is made up of the broad ligament, oviduct, ovarian ligament, and ovarian vessels. About 5 per cent. of all ovarian tumors are solid.

Fibromata are histologically identical with similar tumors in other organs. They are of rare occurrence, seldom grow to large size, and are usually pedunculated.

Myomata are rare, though not so rare as fibromata. They are composed of the usual unstriped muscle fibre and fibrous tissue—fibromyoma. The muscle fibre is traceable from the ovary to the ovarian ligament at the point where the ligament penetrates the paroöphoron. The distinction between the myoma and the spindle-cell sarcoma, even with the microscope, is not always easy. These tumors sometimes grow to large size.

Sarcomata are not of frequent occurrence. They sometimes occur, especially among children, in connection with dermoid cysts, or follow their removal. The spindle-cell is more frequent than the round-cell variety. As in sarcoma elsewhere, rapid growth, speedy degeneration, and metastatic infection of other organs characterize the disease. Both ovaries are usually primarily involved at the same time.

Carcinoma. Little is known of primary carcinoma of the ovary. It usually arises, if at all, in both ovaries at the same time. Secondary carcinoma may occur by extension from neighboring organs or by metastasis.

Benign Papillomata (solid warty growths) arise from the outer surface of the ovary; they may spread to the peritoneum and broad ligaments, and are very prone to undergo malignant changes.

The identification of solid ovarian tumors will usually require the clinical history, conjoined manipulation, exploratory incision, and microscopic examination. The clinical history will often suffice to separate the malignant from the benign growths. Conjoined examination will outline a tumor in the ovarian region, will show that it is not connected with the uterus, and will determine its size, form,

mobility, and consistency. Exploratory incision will further define its physical characteristics and its exact relation to adjacent organs. The diagnosis is concluded by the microscope.

The Treatment of benign growths without pressure symptoms or functional disturbance is expectant. That of large benign tumors or of malignant tumors is early removal. The mode of enucleation and ligature of the pedicle is the same as for cystic ovarian tumors. See Ovariotomy.

CHAPTER XXXII.

CLASSIFICATION AND PATHOLOGY OF OVARIAN AND PAROVARIAN CYSTS, AND OVARIAN HYDROCELE.

THE ovary consists of two parts:

1. The outer cortical or egg-bearing part, which contains the Graafian follicles, called the *Cortex*.

2. The inner vascular or medullary zone, which never contains follicles or ova; this part is in relation with the hilum of the ovary, is composed of fibrous tissue and traversed by numerous bloodvessels, and is called the *vascular* or *medullary portion*.

In relation with the ovary and situated in the broad ligament is a remnant of the Wolffian body, which has no physiological significance, called the Parovarium.

Cystic tumors may arise:

1. From any portion of the ovary—Ovarian Cysts.
2. From the parovarium—Parovarian Cysts.

OVARIAN CYSTS.[1]

Mode of Development of Ovarian Cysts.

Ovarian cysts may be developed:

1. From degenerated Graafian follicles, or corpora lutea; this includes undeveloped Graafian follicles. The origin of such cysts is confined to the cortex.
2. From the remains of the Wolffian body in the hilum or medullary zone of the ovary.
3. From the stroma of any part of the ovary, by colloid degeneration.
4. From any part of the ovary by malignant degeneration.
5. From dermoid elements so disposed as to produce the tumor known as dermoid cyst.

The type of an ovarian cyst, like the type of similar growths in other organs, corresponds to that of the tissue in which it originates. A cyst springing from the epithelial glandular elements in the cortex belongs to the *epithelial type*. A cyst springing from the connective-tissue stroma of any part of the ovary belongs to the *connective-tissue type*. The former may undergo carcinomatous degeneration; the latter, sarcomatous degeneration.

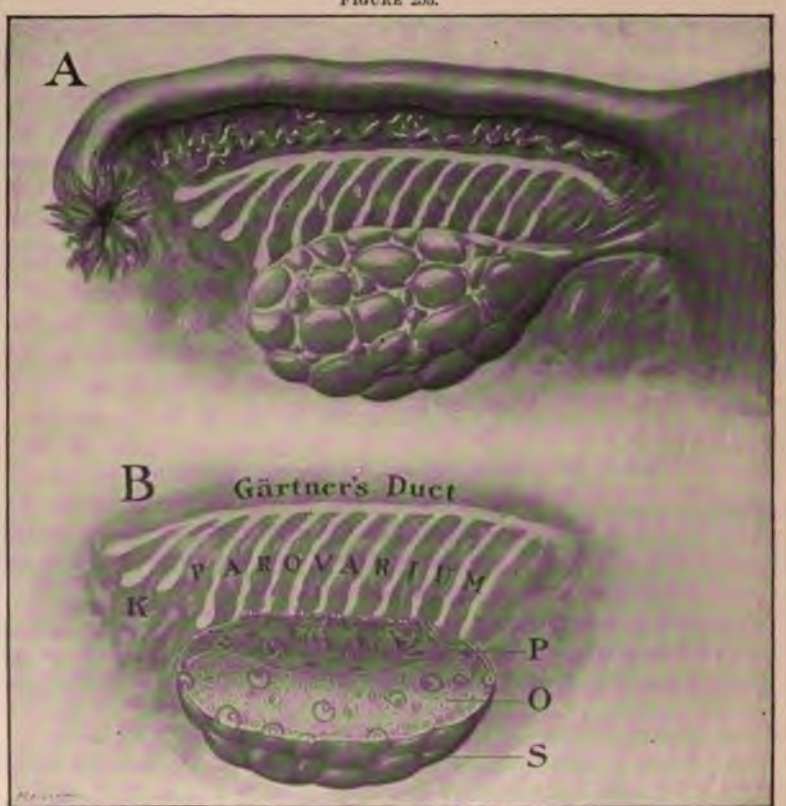
Cysts springing from the stroma may contain also epithelial elements—perhaps from the remains of the Wolffian body or from some other embryonic source.

[1] The pathology of ovarian and parovarian cysts is to some extent an adaptation from the Surgical Diseases of the Ovaries and Fallopian Tubes, by J. Bland Sutton.

Unilocular Ovarian Cysts.

Unilocular ovarian cysts, sometimes called monocysts, are, strictly speaking, rare. Many of these cysts in their inception are enlarged Graafian follicles, and when small their walls are lined by the typical membrana granulosa of the follicle. Almost all tumors classed as monocysts may have apparently a single cavity, but close examination usually will show numerous small loculi in their walls. Sometimes, as stated by Sutton, imperfect septa or bands running from

FIGURE 253.



Cyst-producing region of the ovary and its surroundings:
A. Uterus, Fallopian tube, parovarium, and ovary.
B. Gärtner's duct, parovarium, and ovary shown in section; P, paroöphoron, sometimes called the vascular or medullary zone; O, oöphoron, this is the egg-bearing portion, sometimes called parenchymatous zone, sometimes the cortical portion; S, free external surface of ovary. K. Kobelt's tubes.

one part of the cyst-wall to another show that the cyst was originally multilocular. Parovarian cysts, which are usually unilocular, have often been mistaken for unilocular ovarian cysts; hence the impression that the latter are quite common.

The cyst-wall is composed of three layers: the outer layer of endothelial cells, or occasionally, in small growths, of cuboidal epithelium; the middle layer of white fibrous tissue, containing bloodvessels and

lymphatics; the inner layer, which, if the cyst is of follicular origin, is composed of membrana granulosa, like that of the Graafian follicle. This membrana granulosa is maintained until the cyst reaches the approximate size of an egg. In tumors the size of an orange the lining layer changes to flat, stratified epithelium. In large cysts containing one or more gallons the epithelium disappears by atrophy and gives way to fibrous tissue. The atrophic process is due to pressure of the fluid contents. The pedicle, which connects not only these, but also other pedunculated ovarian cysts with the uterus, is made up of broad ligament, round ligament, oviduct, and ovarian bloodvessels.

The fluid contained in some unilocular cysts is identical with mucus. This fact is doubtless owing to the lining of columnar epithelium.

In some ovaria cysts the walls are lined with skin supplied with an outgrowth of hair, sebaceous and sweat glands, teeth, and other dermal appendages; these are dermoid cysts.

FIGURE 254.

Microcystic degeneration of the ovary; the ovary to the right shows numerous small cysts scattered over the surface; these are Graafian follicles which have undergone cystic degeneration, and may take on excessive growth and develop into large tumors, or may remain as here represented; on the other side is shown a similar condition of the ovary in section.

Unilocular ovarian cysts vary in size from the capacity of a single follicle to that of several gallons.

Non-proliferating, Multilocular Ovarian Cysts.

Many multilocular cysts, or polycysts, are probably identical in their mode of development with the unilocular variety just described.

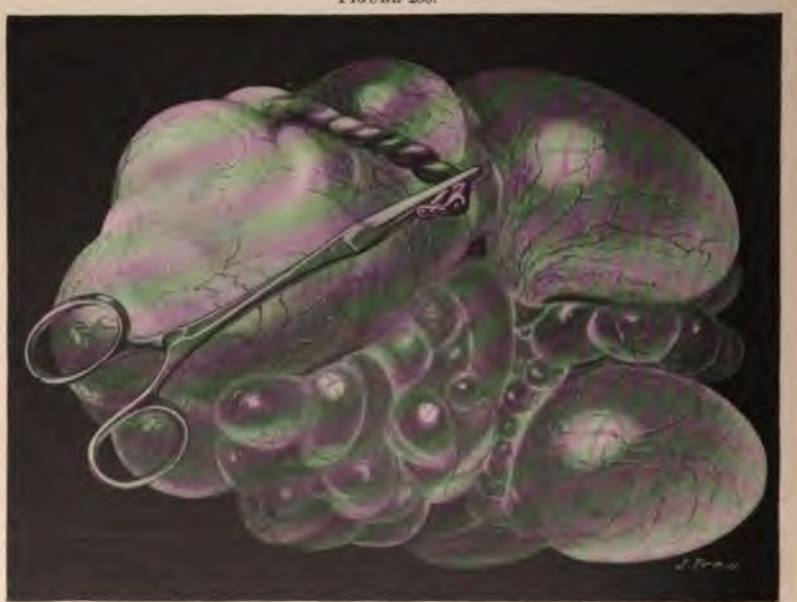
An aggregation of Graafian follicles which have failed to rupture and discharge their contents may be distended by their own secretions. The failure to rupture may be due to inflammatory thickening and toughening of the walls of the sac. The follicles may then remain simple small retention cysts. See Microcystic Degeneration of the Ovary in Chapter XXI. Retention cysts may form in one or many follicles.

Proliferating Multilocular Ovarian Cysts.

In very many cases the follicles may take on new growth and develop into palpable ovarian cysts. This simple cystic development may increase until the tumor becomes enormous, a burden to the patient and a destroyer of life. With increasing size, as in the unilocular variety, the cells of epithelium lining the various compartments become flattened, and finally may disappear by pressure. The cyst-wall has the same structure as that of monocysts.

Adenoma. The germinal epithelium of a multilocular cyst may proliferate greatly and may form glandular structures, and the tumor become a so-called *glandular cyst* or *adenoma.* Proliferating adenoma

FIGURE 255.



Multilocular ovarian cyst, sometimes called ovarian adenoma, in section; the larger cavity is primary; the smaller cavities, secondary.

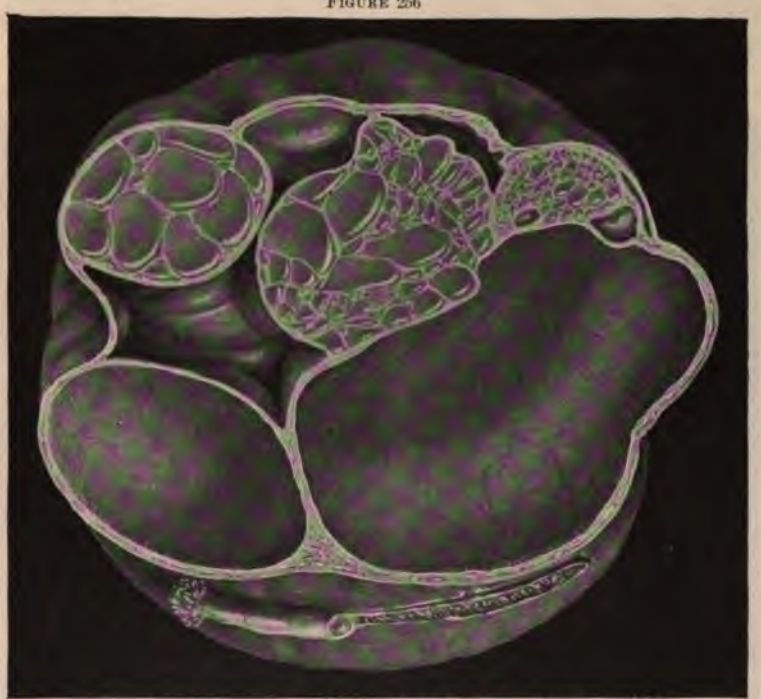
is recognized as one of the most common forms of ovarian cyst. It often grows to enormous size. The whole is made up of numerous small cysts or loculi; they vary in size from the capacity of a drachm to that of a quart or more of fluid. Sutton recognizes three varieties of loculi: 1. The large primary cavities. 2. A honeycombed-like mass of cavities which develops in the wall of the primary cyst and projects into it. This mass is made up of secondary cysts; they are mucous retention cysts. 3. Small-sized cavities without honeycombed arrangements which have the histological characteristics of distended ovarian follicles. The relation of the primary and secondary cysts to each other is shown in Figure 256. Ovarian adenomata have a strong tendency to become malignant; hence the importance of early removal.

The wall of an ovarian cyst may undergo:

1. Fatty degeneration.
2. Calcareous degeneration.
3. Myxomatous degeneration.
4. Malignant degeneration ; sarcoma or carcinoma.

In ovarian cysts often are found dermoid elements in small or large quantities, such as hair, mucous membrane, skin, sebaceous and sweat glands, unstriated muscular fibre, fat, and teeth. A single tumor may have some cysts containing dermoid elements, others containing mucus, and others which are like distended Graafian follicles.

FIGURE 256



Multilocular ovarian cysts, sometimes called ovarian adenoma.

The adenomatous cyst often shades into the dermoid type by a gradation which, from the clinical standpoint, is almost imperceptible ; the dividing line, therefore, between the adenomatous and the dermoid varieties of ovarian cysts is arbitrary and impossible to define. The great clinical importance, however, of dermoid cysts calls for special description, which will appear later.

Characteristics of the Fluid of an Ovarian Cyst.

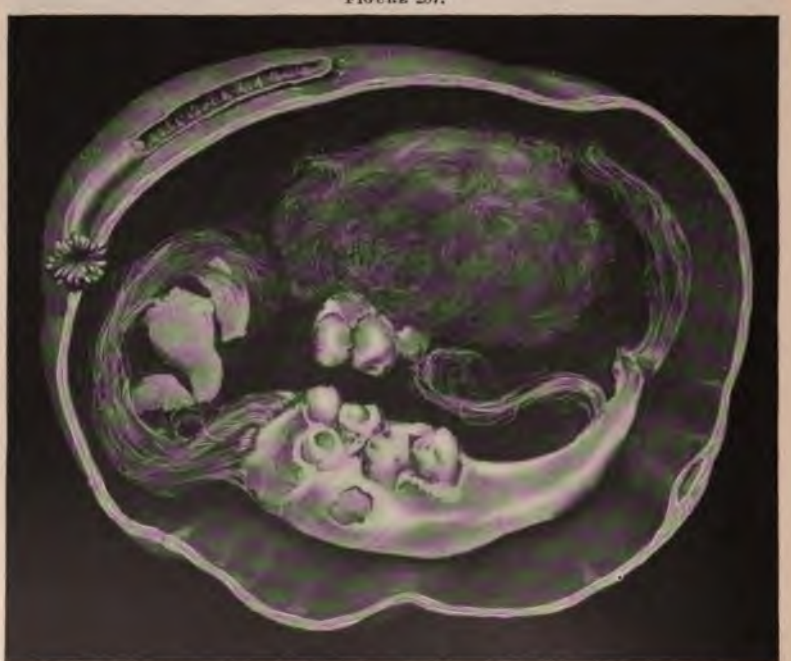
The natural fluid contents of an ordinary ovarian cyst are usually transparent, clear, and of light-straw color, and of a specific gravity from 1010 to 1050. In the progress of the disease secondary

changes occur which make the widest variation in its physical properties. This variation is caused by the admixture of blood, pus, fat, epithelial cells, cholesterin, and by chemical changes. The fluid therefore may be thick, thin, dark, light, clear, muddy, chocolate-colored. Different fluids may be present in the different compartments of the same cyst.

Ovarian Dermoid Cysts.

The dermoid may be defined as a cyst containing skin or mucous membrane. The origin of dermoid cysts is a matter of speculation. Only two of many theories are worthy of consideration: 1, that they arise from epiblastic and mesoblastic fœtal remains in the ovary; 2, that they arise from the epithelium of the Graafian follicles.

FIGURE 257.



Dermoid ovarian cyst in section, showing inside of cyst cavity, which contains a lower jaw and a fragment of another jaw, with teeth, small fragments of bone, and considerable hair: the upper mass of hair is in the shape of a ball, and is held together by the fatty contents of the cyst, which, at the temperature of the body, is liquid, but becomes solid upon exposure to the ordinary temperature of the air, that is, about 70° F.

Dermoid cysts are found not only in the ovary, but in various other parts of the body. The quantity of dermoid elements is variable. The skin or mucous membrane may line the entire cyst or may be discernible only over small isolated areas. When the dermoid elements are contained only in a single small compartment of a large multilocular cyst the dermoid character of the growth is apt to be overlooked.

Ovarian dermoids may contain any or all of the following structures and their products:

Skin,	Teeth,
Mucous membrane,	Mammary gland,
Sebaceous glands,	Nail,
Sweat-glands,	Horn,
Hair,	Unstriped muscle,
Brain-like matter,	Fat.

Figure 257 illustrates some of the peculiarities of these extraordinary growths.

The hair sometimes is present in great abundance, and may be matted together in the form of a round ball the size of an orange. The color according to Sutton, is variable, but does not necessarily correspond with that on the individual's head. In aged people it may be gray, and may have been shed, leaving the cyst-lining bald.

Extensive involvement of both ovaries in dermoid cystic disease, even though little normal ovarian tissue remains, does not positively render the woman sterile. In one case the patient, at the age of thirty-nine, had had twelve children, the last one was three months old, at the time of removal of two dermoid ovaries.[1]

Dermoid tumors occur at all ages, from infancy to extreme senility. They are occasionally found in children and are not uncommon in young women. Unlike other forms of ovarian cysts which destroy life in three or four years, dermoids may exist for a lifetime and give little or no inconvenience. They have been found post mortem in aged women who may have had them from the period of sexual maturity and have never been aware of their presence. Like other cysts, however, they may at any time undergo suppuration and therefore become dangerous. Although usually classed as innocent tumors, they occasionally give rise, especially in childhood, to malignant degeneration.

The fluid content of a pronounced dermoid cyst is an oily fat; at the temperature of the body it is liquid, but at a lower temperature semisolid. The fatty contents are very irritating to the peritoneum, and when it breaks into the peritoneal cavity the epithelial elements of the cyst may engraft themselves upon the peritoneum and give rise to secondary growths.

Papillomatous Cysts of the Ovary.

Papillomatous cysts more commonly develop in the hilum or in the medullary portion of the ovary. They usually contain a clear, thin, yellowish fluid, which may be reddish from admixture of blood. In chemical properties and microscopic appearance this fluid resembles that of ordinary ovarian cysts. These cysts have the following characteristics:

They are rare before the twenty-fifth year, more common between the ages of thirty and fifty, seldom attain the size of ordinary ovarian cysts, and are usually unilocular. They commonly develop

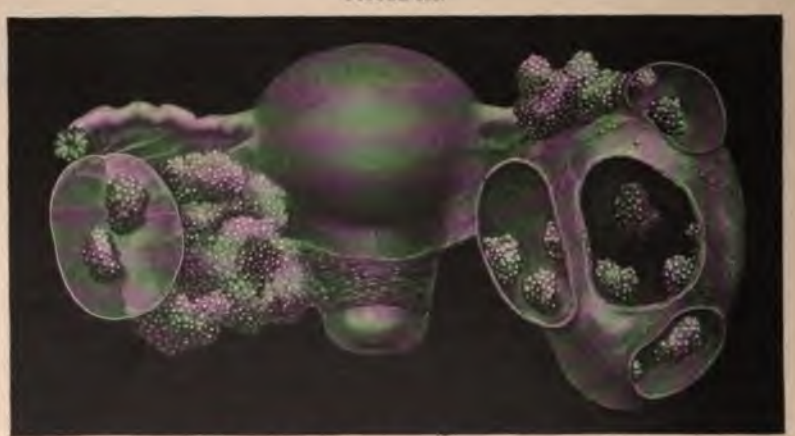
[1] Cullingworth. J. Bland Sutton. Surgical Diseases of the Ovaries and Fallopian Tubes.

between the layers of the mesosalpinx; and finally, with increased growth, separate the layers of the broad ligament and force their way between them to the lateral walls of the uterus, and often, therefore, feel, on digital touch, like an outgrowth from the uterus. They present both inside and outside in variable quantity warty or papillomatous growths; hence the name, papillomatous cysts.

The cyst-wall is composed of the usual fibrous tissue and of an inner lining of cylindrical epithelium. The source of this epithelium is not definitely known. It is thought to be from remnants of epithelium from the Wolffian body.[1]

The characteristic of papillomatous cystic tumors is the warty growth which they contain. The warty masses proliferate rapidly, bleed freely on manipulation, are soft and friable, vary in quantity

FIGURE 258.



Papillomatous ovarian disease. On the right side is a cyst from the paroöphoron or vascular zone of the ovary; in the wall of this cyst have developed three secondary cysts, which are shown in section and which contain warty growths; observe also the warty growths both on the outside and inside of the cyst; to the left is a superficial papilloma of the ovary, which lies between the ovary and the uterus. Papillomatous disease on the inside of this ovary is also shown in section.

from that of the smallest wart to that of an orange, may be either sessile or pedunculated, and, according to the variable blood-supply, pale or pink. These papillomatous elements may so increase in quantity as to force their way by rupture or perforation through the cyst-walls, spread over the outside, and affect the adjacent peritoneum. They sometimes undergo calcification. Warty ovarian cysts may be associated with dermoids, and occasionally with sarcoma of the ovary. Tapping is contraindicated, for if fluid escapes into the abdominal cavity, the peritoneum may become infected; hence in the removal of them care should be used to prevent the escape of fluid.

It should be noted in this connection that other papillomatous cysts are found in the ovary and broad ligaments which have not developed from the medullary portion or hilum of the ovary; these cysts, according to Sutton, differ as follows from the warty cysts just described:

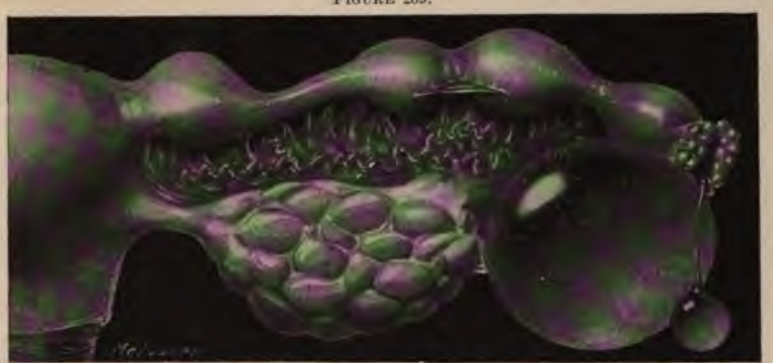
[1] Doran. Transactions Pathological Society, London, vol. xxvii.

1. They may be in any part of the ovary.
2. They are usually multiple.
3. The warts are of almost cartilaginous hardness.
4. They are not known to grow to such size as would make them dangerous to life.
5. They are associated frequently with uterine myomata.

PAROVARIAN CYSTS.

The parovarium from which these tumors spring is the remnant of the Wolffian body. It has no known physiological significance.

FIGURE 259.



Small parovarian cyst. This cyst has sprung from the parovarium, and is therefore entirely distinct from the ovary; to the right is the hydatid of Morgagni suspended from a long, slender pedicle, which is attached to one of the fimbriated extremities of the Fallopian tube. The hydatid of Morgagni has been known to grow to the size of a small orange, and it then has the same general appearance as the parovarian cyst, but is distinguished from it by the fact that it springs from the extremity of the Fallopian tube. The Fallopian tube shows numerous points of expansion and constriction, one of them being at the isthmus; this is known as the salpingitis isthmica nodosa, common in gonorrhœal salpingitis. Myoma and adeno-myoma of the tube present much the same gross appearance. This condition of the tube is rarely found in connection with cysts of the parovarium.

The epididymis and vasa efferentia in the male also spring from the Wolffian body and are the homologue of the parovarium. If the broad ligament is stretched and held up to the light, a series of small tubules will be seen radiating from the ovary and joining at right angles a longitudinal tubule. The tubules are the parovarium. See Figure 253. They are of three kinds: 1. The vertical tubules. 2. The outer tubules, free at one end—Kobelt's tubes. 3. The longitudinal tube—Gärtner's duct. This duct is the homologue of the vas deferens in the male; it may occasionally be traced downward to the vagina. The parovarium lies between the folds of the mesosalpinx.

The little tubules of Kobelt are very often distended by their fluid contents into small cysts, usually not larger than a pea. These cysts, which have little or no significance, are frequently confounded with the hydatid of Morgagni. A distended vertical tubule may become separated and form a pedunculated cyst. This may rupture, discharge its contents into the abdominal cavity, and become obliterated. The remnant of the cyst-wall then presents a fringe-like appearance.

The usual parovarian cyst is unilocular, that is, it springs from a

single vertical tubule, and most commonly develops without a pedicle, and remains between the layers of the mesosalpinx. As it grows larger it may force its way between the layers of the broad ligament and lies in close relation with the uterus. The Fallopian tube, with its fimbriated extremity attached to the ovary and its uterine end to the uterus, is stretched over the enlarging cyst-wall. The tube in this way is often enormously elongated.

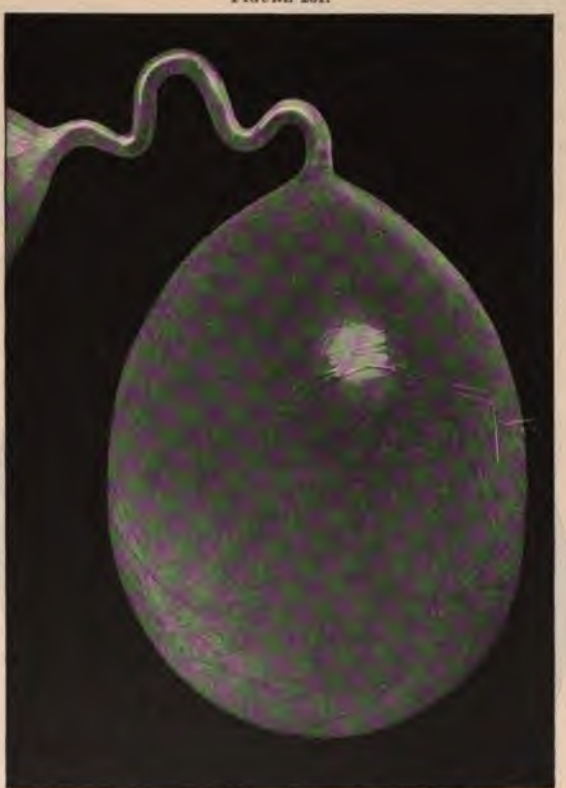
FIGURE 260.

Parovarian cyst. Observe the ovary separate from the cyst and the long, stretched-out Fallopian tube which surrounds the cyst-wall.

The walls of small cysts are usually quite thin and transparent; when larger they become thick, opaque, pearly-like, and of conjunctival blue color. The lining of the small cysts preserves the columnar epithelium of the tubule; in larger cysts the epithelium becomes flattened; in the largest cysts the atrophic influence of pressure is so great as entirely to destroy the epithelium.

Unlike the ovarian cyst, which is a diseased ovary, the parovarian cyst usually has a normal ovary attached to the side of it. The fluid is almost always clear and colorless, like spring-water, and the nitric-acid and heat tests show albumin. The specific gravity is usually much less than 1010. The reaction is faintly acid. See Tabular Diagnosis between Parovarian and Ovarian Cysts, in the following chapter. Adhesions rarely form about these cysts. The peritoneal covering is easily stripped off, and the cyst, therefore, easily enucleated.

FIGURE 261.



Ovarian hydrocele, natural size. The tortuous, retort-shaped Fallopian tube connects the tumor with the uterus.

The parovarium does not take on demonstrable cystic disease before the age of puberty. The more common age for the development of this form of cyst is from eighteen to thirty-five. These cysts do not tend to rapid degeneration, and may therefore be carried for years with little or no danger. Rupture or tapping is sometimes followed by obliteration and cure.

Cyst of the Broad Ligament is a name reserved by many to designate parovarian cysts. Various other cysts, however, also develop in the broad ligament. The name, therefore, has no definite significance beyond the fact that it designates a cyst situated between

the layers of the ligament. Such a cyst may originate in the ovary and gradually force its way between the folds of the broad ligament. It not uncommonly originates in the paroöphoron near the hilum of the ovary. The great majority of broad ligament cysts are either paroöphorotic or parovarian. When they are of ovarian origin they are usually called intraligamentous ovarian cysts.

The Hydatid of Morgagni may grow to such considerable size as to be a mechanical irritant and require removal.

OVARIAN HYDROCELE.

In this rare and curious disease the dilated Fallopian tube communicates by its abdominal opening with the cavity of a cyst. The opening is usually large and circular. According to Bland Sutton,[1] the formation of the cyst is analogous to that of hydrocele in the male. He gives evidence to show that it arises in a tunic of peritoneum,

FIGURE 262.

Tubo-ovarian cyst. The genesis of this cyst is set forth in Chapter XXI. Sometimes the sac of a tubo-ovarian cyst suppurates; it is then known as a tubo-ovarian abscess.

which sometimes invests the ovary as the tunica vaginalis covers the testis.

Ovarian hydrocele may suppurate, and may then easily be confounded with a tubo-ovarian abscess. The treatment is ovariotomy.

[1] Surgical Diseases of the Ovaries and Fallopian Tubes.

Ovarian hydrocele has been confounded hitherto with tubo-ovarian cyst. The distinctions between these two cysts are shown in the following tabular statement:

OVARIAN HYDROCELE.	TUBO-OVARIAN CYST.
1. Salpingitis has nothing to do with the cause, although it may be present as a complication.	1. Salpingitis is a cause of the communication between the tube and ovarian cyst. See Chapter XXI.
2. The opening between the tube and sac is large and round or oval, and is the dilated abdominal opening of the tube.	2. The opening is variable in size, and usually does not correspond to the abdominal ostium; if the cyst is purulent—*i. e.*, if it is a tubo-ovarian abscess—the opening is usually small.
3. The tube, not large, is usually tortuous, like the worm of a retort.	3. The tube is usually larger and not tortuous.
4. There is apt to be an intermitting discharge of fluid from the tube through the uterus.—*hydrops tubæ profluens.*	4. The intermitting discharge—*salpingitis profluens*—not common.

CHAPTER XXXIII.

SECONDARY CHANGES—SYMPTOMATOLOGY—DIAGNOSIS, PROGNOSIS, AND DIFFERENTIAL DIAGNOSIS OF OVARIAN AND PAROVARIAN CYSTS.

SECONDARY CHANGES.

THE principal secondary changes in ovarian and parovarian cysts are: 1. Infection. 2. Twisting of the pedicle. 3. Rupture of the cyst.

1. Infection.

The sources of infection from which bacteria may reach the cyst are the adjacent organs—viz., the adherent Fallopian tube, urinary bladder, and intestine. Formerly, when tapping and aspiration were frequent and asepsis was disregarded, infection was frequently introduced by the puncture. Small cysts that remain fixed in the pelvis in close relations with the pelvic viscera are more subject to inflammation than the large growths that fill the abdomen. When adhesions occur in large cysts they are usually stronger and more extensive in the pelvis than in the abdomen.

The Fallopian tube is doubtless the greatest carrier of infection. This may be inferred from the fact that when an infected cyst becomes adherent to adjacent organs the strongest adhesions are usually where the poison, if it came through the tube, would first reach the cyst—viz., about the abdominal end of the tube. The inference is strengthened by the almost constant presence of salpingitis in connection with infection of the cyst-wall. Inflammation and consequent adhesions from this source are not, however, confined to the neighborhood of the tube; they may extend indefinitely over the tumor, gluing it to any adjacent peritoneal surface, visceral or parietal, and the infection may even penetrate the cyst-wall.

The intestine and bladder, if inflamed, are prolific sources of infection. The inflamed gut readily adheres to the cyst-wall, and becomes softened by the inflammatory process or thin from the atrophic results of pressure. Germ-bearing gases may, according to Sutton, pass into the cyst and set up suppurative inflammation of the sac, or the adherent gut and sac-walls may become perforated; the sac-contents will then escape by way of the bowel. Extensive infection of a cyst is not infrequently traceable to an inflamed adherent vermiform appendix.

Suppuration. Inflammation of the cyst often goes on to suppuration and to the formation of the most extensive adhesions. In acute suppuration the symptoms rapidly become grave; they are: 1. Sud-

suppuration the symptoms rapidly become grave; they are: 1. Sudden enlargement of the tumor. 2. Severe pain and tenderness. 3. Rapid and weak pulse. 4. High temperature and exhaustion. Acute nephritis, with albuminuria, is a frequent complication. In some cases putrefaction leads to the formation of gases in the cyst. A tympanitic note is then elicited by percussion over the tumor dulness. In rare cases rupture of the sac and the discharge of its purulent contents through the intestine or some other viscus may avert the otherwise fatal result. Usually the only hope lies in prompt ovariotomy.

Adhesions are among the most constant results of inflammation. Formerly they were the *bête noir* of the surgeon. Now, with improved technique, tumors that would formerly have been abandoned after an exploratory incision are almost always removed. Adhesions may be abdominal or pelvic, visceral or parietal. Visceral adhesions are those which unite tumor to the uterus, bladder, liver, and other abdominal or pelvic viscera. Adhesions to the omentum are common and often extensive. Intestinal adhesions sometimes give rise to dangerous, even fatal, obstruction of the bowel. Pelvic adhesions are more inaccessible, and therefore more dreaded than the parietal. Two large ovarian cysts, one from the right and the other from the left ovary, may come in contact with each other and become strongly and broadly united. The difficulties of diagnosis and operative removal are then much increased.

2. Twisting of the Pedicle.

Rotation of the cyst, with consequent twisting of the pedicle, is an occasional and serious accident.

Acute Torsion is a sudden rotation of the cyst with sufficient twisting of the pedicle to set up grave symptoms.

Chronic Torsion is a slow rotation of the cyst, with gradual twisting of the pedicle. This gives the tumor an opportunity to readjust itself to the changed conditions. The symptoms are less severe and the course more prolonged than in acute torsion. The impaired circulation may be partially restored through adhesions. The pedicle in rare cases is completely twisted off. The detached tumor must then receive its blood-supply, if at all, by way of vessels which reach it only through adhesions.

Etiology. The probable causes are:

1. Alternate distention and evacuation of the bladder or bowel.
2. A fall or other violence.
3. Violent exertion; tight lacing.
4. Growing pregnant uterus.
5. Long, slender pedicle, especially if associated with ascites.

Pathology. The pathological results of torsion are these:

1. Œdema from obstruction to the circulation in the sac wall due to compression of bloodvessels as they pass through the twisted pedice.

2. Engorgement, which may cause only occasional extravasations of blood from small vessels; or may be so intense as to cause rupture of larger vessels, and consequent profuse hemorrhage into the sac and great distention and rupture of the cyst wall, and discharge of the cyst contents into the abdomen.
3. Strangulation of the cyst, which may result in:
   Gangrene of cyst.
   Atrophy of cyst, rare and only in small tumors.
   Separation of the tumor from the pedicle.
   Peritonitis with obstruction of the bowel from adhesions.
4. Danger to life from:
   Hemorrhage, Sepsis,
   Peritonitis, Suppuration of cyst causing exhaustion.

Diagnosis. The diagnostic signs are not positive; they are:

1. Sudden increase in the size of the tumor, the cyst growing more and more tense and the pain more acute.
2. Rupture of the sac, recognized by sudden disappearance of the enlarging tense cyst.
3. Symptoms of peritonitis following the above conditions.

Prognosis. Rotation, if sufficiently acute to cut off the circulation, would result in gangrene of the cyst, and, unless ovariotomy were speedily performed, infection and death would ordinarily follow.

Treatment. The treatment of both acute and chronic torsion is ovariotomy.

3. Rupture of the Cyst.

The cyst may rupture into the abdominal cavity, or into any of the abdominal viscera. One locument of a multilocular cyst may rupture into another. Thin-walled secondary locuments very commonly rupture into the abdominal cavity, leaving the remaining compartments of the cyst intact. The opening made by rupture may reunite and the cyst refill.

Causes:

1. Softening or thinning of the cyst wall in one or more places; this may occur as the result of inflammation or distention.
2. Hemorrhage into the cyst-wall or into the sac.
3. Fatty degeneration or gangrene of the cyst-wall.
4. Suppuration in the cyst.
5. Papillomatous growths penetrating the cyst-wall.
6. Direct injury from blows, falls, careless palpation in examination and contraction of the abdominal wall in labor.
7. Torsion; see twisting of the pedicle.

Results. A ruptured parovarian cyst may in exceptional cases become obliterated and thereby spontaneously cured. Cases of supposed ovarian cysts have been reported as cured by rupture or tapping, but it is known that an ovarian cyst cannot be cured in this

way; the tumors in question must therefore have been parovarian. The former practice of tapping ovarian cysts as a means of radical cure has therefore been abandoned. Even parovarian cysts are better treated by removal.

Rupture may occur into:

1. Bladder.
2. Vagina.
3. Rectum.
4. Peritoneal cavity, most frequent.
5. Small intestine, rare
6. Stomach, rare.
7. Fallopian tube, rare.
8. Abdominal wall, rare.

Fate of Escaped Contents and Sequels of Rupture:

1. If rupture of a parovarian or an ovarian cyst containing innocent aseptic fluid takes place into the abdomen, the fluid may be absorbed through the peritoneum and eliminated by the kidneys without harm.
2. If rupture of a papillomatous cyst takes place into the abdomen, the cyst contents are liable to form secondary papillomata on the peritoneum.
3. The contents of a dermoid cyst may engraft septic epithelium on the peritoneum and cause fatal peritonitis.
4. The colloid contents of a cyst may cause peritonitis.
5. The contents from a malignant cyst may engraft malignant disease on the peritoneum.
6. If fluid passes by rupture into a hollow viscus, the opening may close and the sac refill, or the opening may remain and transmit the contents of the viscus to the sac; thus feces and gas may escape from the bowel to the tumor and replace the tumor dulness with resonance on percussion; or urine from the bladder may fill the sac.

The Symptoms, Diagnosis, and Prognosis of rupture will vary according to the condition outlined in the preceding paragraphs. The gravity of the case will depend upon the nature of the escaped fluid. The accident even in the non-fatal cases is apt to be marked by sudden severe pain, and by more or less severe peritonitis with adhesions. A monocyst upon discharge of its contents will collapse. A polycyst upon rupture of one or more of its locuments only changes its form. Rupture of an infected cyst is usually fatal.

Treatment. The greater the gravity of the case the more urgent the indication—*immediate ovariotomy.*

SYMPTOMATOLOGY.

The Symptoms of ovarian and parovarian tumors, of which none is pathognomonic, are these:

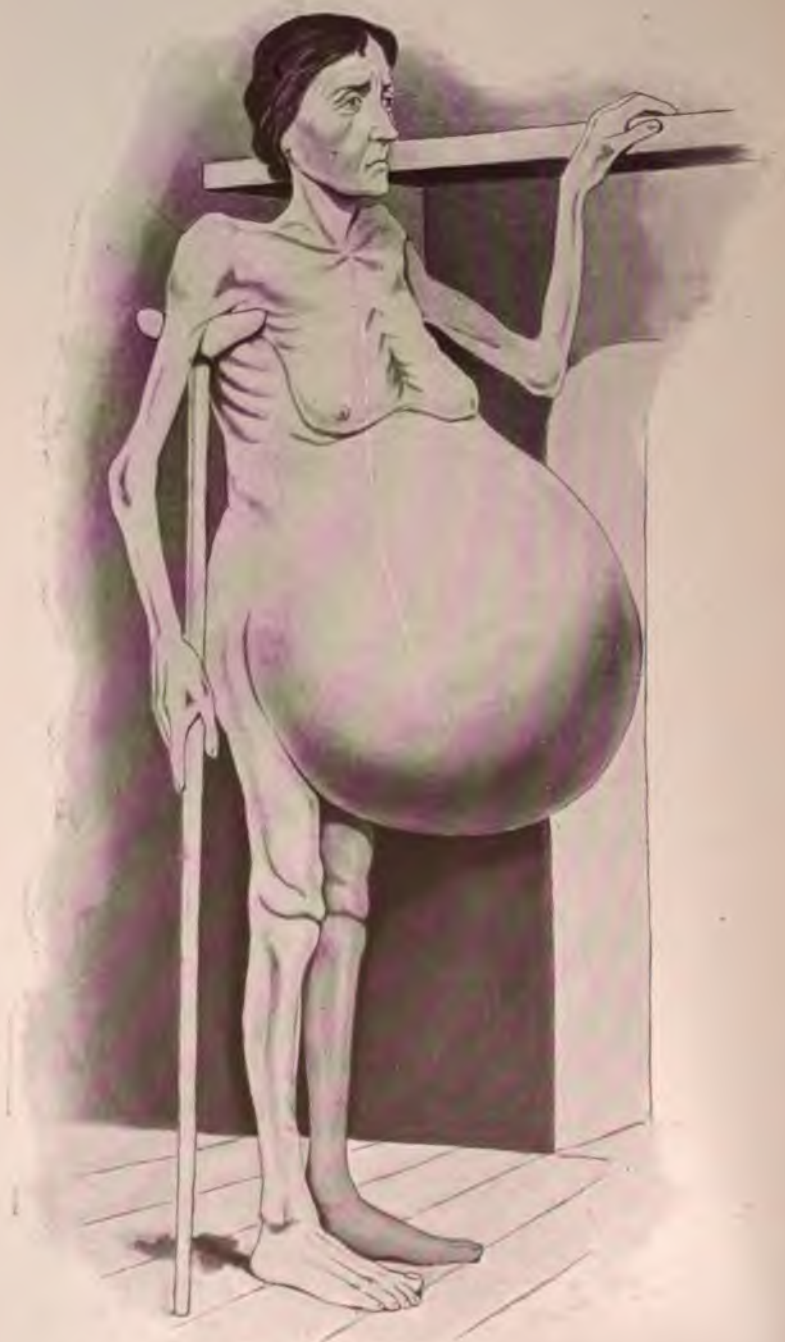
1. Nutritive disorders; intestinal indigestion, and in many cases, constipation.
2. Menstrual disturbances; not very significant:
   a. Uterine hemorrhage or amenorrhœa.
   b. Dysmenorrhœa.

3. Sterility; not invariable, even in bilateral cases.
4. Pregnancy may be simulated.
5. Pains from peritonitis.
6. Pressure symptoms; these are:
   - *a.* Vesical and rectal tenesmus.
   - *b.* Œdema of vagina, vulva, and lower extremities from pressure on iliac veins.
   - *c.* Abdominal pains.
   - *d.* Uterine displacements.
   - *e.* Hemorrhoids.
   - *f.* Urinary functions disturbed; Albuminuria from pressure on renal artery; suppression of urine and hydronephrosis from pressure on ureters. Vesical irritation and cystitis from pressure on bladder.
   - *g.* Ascites from pressure on vena cava, or from malignancy.
   - *h.* Pressure on thoracic viscera may cause most distressing symptoms, such as weakness of the heart, rapid pulse, and dyspnœa so extreme that the patient must continuously maintain the sitting posture, night and day; pressure on the stomach and bowels may cause nausea, vomiting, and other alimentary disturbances; pressure on the liver and bile ducts may cause catarrhal jaundice.
7. Umbilical hernia—occasional.
8. Atrophic lines on abdominal skin when cyst is large.
9. **The Facies Ovariana.** This is a peculiar facial expression that is highly diagnostic of the disease in the later stages. It is difficult to describe, but once seen is easily remembered. The natural facial expression is modified as follows:
   - *a.* The face is shrivelled, elongated, and has an anxious and careworn expression.
   - *b.* The nostrils are wide, the angles of the nose and mouth are drawn down, and the lips are thin.
   - *c.* The cheeks are furrowed and the face is marked by deep wrinkles.
   - *d.* The space between the eyelids and the bony margin of the orbits is sunken and hollow.
   - *e.* The whole areolar tissue of the face is atrophied.
   - *f.* The face is pale, but not with that peculiar leaden, sallow, or parchment-like color seen in malignant diseases.[1]

The facies ovariana is quite in contrast with an indescribable and less marked facial expression known as the *facies uterina*. This is often present in pregnancy and sometimes in cases of uterine tumors. The face is full and flushed.

[1] Adaptation from Peaslee's Ovarian Tumors.

PLATE XVI.



Enormous Ovarian Cyst, with Pendulous Abdomen and Characteristic Emaciation.

FIGURE 263.

The facies ovariana.[1]

DIAGNOSIS.

The recognition of a large, uncomplicated ovarian cyst is usually not difficult. The means of diagnosis are these:[2]

1. Clinical history.
2. Inspection.
3. Palpation.
4. Percussion.
5. Conjoined examination.
6. Measurement.
7. Aspiration or tapping.
8. Exploratory incision.

The physical examination by inspection, palpation, percussion, or conjoined manipulation requires that the abdomen be exposed and that the patient lie on a hard couch or table, preferably the latter.

1. **The Clinical History** should include a consideration of the secondary changes as outlined in this chapter. It also includes the symptoms noted in the foregoing paragraphs, the age, social condition, pregnancies (if any), family history, and menstrual history of the patient.

2. **Inspection.** If the tumor is small, the enlargement will be most apparent on the affected side; as it grows larger and rises out of the pelvis the swelling will be greater in the lower part of the abdomen between the pubes and the umbilicus, and will be nearer the

[1] Peaslee's Ovarian Tumors.

[2] In the diagnosis and differential diagnosis I have made numerous adaptations from the classical work on ovarian tumors by my honored friend and teacher, the late Edmund Randolph Peaslee.

median line. Abdominal enlargement from a unilocular cyst is obviously more symmetrical than from a multilocular cyst. With declining strength the facies ovariana becomes more pronounced.

3. Palpation will show usually a fluctuating tumor: if small, in the pelvis; if large, extending into the abdomen. The mass will be much more distinct on the affected side. The degree and character of elasticity will vary with the tenseness of the cyst and the consistency of the contents. A greatly distended tense sac, especially if the contents are semisolid, may feel like a solid tumor.

Although it is rare to find solid matter predominating in the ovarian cyst, large masses of apparently solid matter, and smaller nodules of very hard or bone-like substance, are often to be detected by palpation. The more solid parts are found rather in the pelvis than in the abdomen. The different locuments of a multilocular cyst are in some cases easily outlined by palpation. The cyst may sometimes be moved from side to side, and up and down; the degree of mobility will depend upon its size, the length of the pedicle, and the extent of the adhesions. In cases of very thick or rigid abdominal walls, and especially of small tumors, anæsthesia facilitates the examination.

4. Percussion. The tumor sac, with its contents, occupies the anterior part of the abdomen; the intestines are in the posterior, lateral, and upper parts; hence the maximum dulness on percussion will be over the anterior and lower portions of the abdomen. Since the cyst extends from the pelvis, the dulness will be continuous from the abdomen into the pelvis; it will, however, cease abruptly or shade off into resonance and tympanites at the limits of the tumor, toward the sides of the abdomen and toward the diaphragm. This is because the spaces above and to the sides of the tumor are filled with intestines. For the relative areas of dulness and resonance, see Differential Diagnosis of Ovarian Cyst and Ascites. The location of the cyst does not change with change in the position of the patient; the areas of dulness correspond to the location of the tumors, and are constant.

The Percussion Wave usually present is elicited by placing the finger-tips of the left hand to one side of the tumor, and with the finger-tips of the right hand sharply tapping or thumping, or with the thumb and finger snapping the other side. In very tense cysts and in cysts with semisolid contents, like dermoids, the wave may be absent.

5. Conjoined Examination, which includes vaginal and rectal touch, will usually show the relations of the uterus to the cyst. The importance of this means of diagnosis is great, for any cyst of pelvic origin not connected with the uterus is almost certainly ovarian or parovarian. If therefore, upon vaginal or rectal touch, the uterus proves to be healthy and normally mobile, with little or no increase in the length of its cavity, the presumption is in favor of an ovarian tumor; if, upon conjoined examination with one or two fingers of the left hand in the vagina or rectum, and the right hand over the abdomen, the uterus can be made out distinct and separate from the cyst, the proof of an ovarian tumor is almost complete.

In very exceptional cases of ovarian cyst, however, the uterus may be enlarged, drawn up out of the true pelvis, immobile, and otherwise abnormal. The cyst may be so moulded to the pelvis as to press the uterus forward and upward and flatten it against the pubes. The tumor and the uterus may, through adhesions or location, be nearly or quite inseparable from each other; such conditions are very indicative of uterine tumors, but are occasionally found with ovarian cysts. See Differential Diagnosis of Ovarian Cysts and Uterine Tumors.

6. Measurements. The circular measurement of the abdomen is increased. The distance from the anterior superior process of the ilium to the umbilicus is greater on the affected side. The distance from the pubes to the umbilicus is relatively more increased than that from the umbilicus to the ensiform cartilage.

7. Aspiration, or Tapping, once a common means of diagnosis, is now almost abandoned. This is because there is always some danger from the possible escape of fluid into the abdominal cavity. The diagnosis can usually be made without tapping, and, moreover, an exploratory incision is safer and more effective.

8. Exploratory Incision is the final resort in diagnosis and differential diagnosis. When this is done the patient should be prepared for ovariotomy, and the tumor, if operable, should be removed.

Under the general heading of diagnosis may be included the diagnosis of adhesions and the diagnosis of malignancy.

Diagnosis of Adhesions.

Adhesion may be recognized, though not with certainty, by the following signs:

1. Immobility of the tumor.
3. Sensitiveness on pressure (peritonitis).
3. Bands of adhesions may sometimes be felt through the vagina or at the sides of the tumor.

Diagnosis of Malignancy.

The physical signs of malignancy, not conclusive, are as follows:

1. Nodular, hard surface.
2. Ascites, always present in malignancy, seldom in benign tumors.
3. Cachexia, and œdema of the lower extremities.
4. Metastasis.
5. Rapid increase of growth and infiltration of surrounding structures.

PROGNOSIS.

The prognosis, without operation, of ovarian and parovarian tumors has been partially indicated under Secondary Change

in the first part of this chapter. Multilocular proliferati cysts and papillomatous cysts, if not removed, usually cau death in about three years. The immediate causes of death a these:

1. Exhaustion due to interference with sleep, nutrition, a respiration.
2. Nephritis, hydronephrosis, uræmia, cystitis, pyelitis.
3. Peritonitis and intestinal obstruction.
4. Suppuration and gangrene of cyst.
5. Rupture of cyst; hemorrhages from any cause.
6. Impediment to labor.

The prognosis with ovariotomy should reduce the mortality to least 5 per cent.

DIFFERENTIAL DIAGNOSIS.

This subject involves: first, the differential diagnosis of ovaria and parovarian cysts from one another; second, the differentiatio of these cysts from other conditions with which they have bee confounded.

Distinction between Ovarian and Parovarian Cysts.

This distinction has been given under pathological anatomy an secondary changes. The following tabular statement, however, wi emphasize the differential points:

Ovarian Cysts.	Parovarian Cysts.
1. Develop from the ovary.	1. Develop from the parovarium.
2. Usually multilocular.	2. Almost always unilocular.
3. Apt to contract adhesions.	3. Do not usually contract adhesions.
4. May be small or attain enormous size; growth rapid.	4. May become quite large, but not so larg as ovarian cysts; growth slow.
5. Never cured by tapping.	5. Sometimes cured by tapping.
6. Fluid may be thick, thin, muddy, light, dark, straw- or coffee-colored, albuminous.	6. Fluid usually light, like spring wate Specific gravity rarely as high as 1010. May b only slightly albuminous or non-albuminous
7. Usually pedunculated unless situated between folds of broad ligament.	7. Usually not pedunculated. Developmen in broad ligament.
8. Sometimes contains warts—*i. e.*, papillomata.	8. Seldom papillomatous.
9. Sac wall does not usually have peritoneal covering.	9. Sac has peritoneal covering, from whic it may be readily enucleated.
10. Apt to become adenomatous or papillomatous.	10. Is neither an adenoma nor a papilloma
11. Is fatal in three or four years. Facies ovariana marked.	11. May not impair health for many years Facies ovariana absent or not marked.

Dermoid Tumors develop from the cortex, and are a specia variety of ovarian cysts. They have been specially described i a preceding chapter. The diagnostic points by which they may

be distinguished from the three kinds of cysts just tabulated are these:

1. Facies ovariana comes very late, if at all.
2. The tumor may exist for many years without impairment of the general health.
3. Abdominal enlargement usually to one side; is otherwise symmetrical.
4. The tumor does not grow to very large size.
5. The contents are too thick to permit tapping even with a large trocar.
6. Inflammation of cysts and adhesions not very uncommon.
7. Spontaneous rupture not common.
8. Œdema of lower extremities rare.
9. Fluctuation and percussion wave obscure or absent.
10. Sac contains dermoid elements.
11. Tumor apt to undergo sarcomatous or carcinomatous degeneration, especially in children.
12. May occur early in childhood.

FIGURE 264.

Shape of abdomen with monocystic ovarian or parovarian tumor.

The Differentiation of Ovarian Cysts from Other Conditions that may be Mistaken for Them.

The pathological conditions that have been mistaken for ovarian cysts may, for convenience of description, be divided into those which originate in the pelvis and those which originate in the abdomen.

Intrapelvic Conditions.		Abdominal Conditions.
Pregnancy	Normal gestation,	Ascites.
	Hydramnios,	Encysted ascites.
	Tubal pregnancy,	Hydatid cysts.
	Gestation in one horn of a bifurcated uterus.	Renal tumors.
		Floating kidney.
		Pancreatic cyst.
		Enlarged liver.
Uterine tumors	Myoma,	Mesenteric cyst.
	Sarcoma,	Cysts of the urachus.
	Carcinoma,	Enlarged gall-bladder.
	Metritis,	Intestinal tumors.
	Hæmatometra,	Fatty tumors.
	Hydrometra,	
	Pyometra,	
	Physometra.	
Inflammatory enlargement	Parametritis,	
	Pelvic abscess,	
	Sactosalpinx,	
	Peritonitis,	
	Pericæal abscess.	

One or more of the above conditions may coexist with ovarian cystoma. The diagnosis is then complicated, difficult, and, without exploratory incision, may be impossible. Before taking up the subjects outlined in the foregoing table it is important to consider the following question:

Question I.: Is there any tumor at all within the peritoneal cavity?

The abdomen has been repeatedly opened for the removal of a supposed ovarian tumor, when no tumor of any kind existed; even more frequently, tapping and aspiration have been done when no fluid was present. One author, in his statistical tables, mentions no less than twenty-one cases of this kind.[1] The following conditions may have the appearance of an intra-abdominal enlargement when no such enlargement exists:

1. Fat in the abdominal walls.
2. Phantom tumor.
3. Tympanites.
4. Fecal accumulations.
5. Distended bladder.
6. Dilated stomach.

1. Fat in the Abdominal Wall. An eminent British surgeon once laid open the abdomen from the pubes to the ensiform cartilage, only to find, instead of an ovarian cyst, a mass of subcutaneous fat. Similar blunders have repeatedly occurred. Such an error at the present day, however, would be almost impossible. No proper signs of ovarian cyst would be present in such a case. The mass of fat in the abdominal wall may be grasped between the hands and isolated from the abdomen. Vaginal touch would also yield negative evidence of a tumor. Great thickening of the abdominal wall from œdema is differentiated by pitting on pressure.

2. Phantom Tumor. Some hysterical women have the power so to contract the abdominal muscles as to force up the tympanitic intestines into a bunch, and in this way to make an apparent abdominal enlarge-

[1] John Clary, in Ovarian Tumors, 1872, Peaslee.

ment in form like that of a tumor. Prolonged firm pressure with the palms of the hands usually overcomes the muscular contraction. The percussion note is decidedly tympanitic. Anæsthesia completely exposes the deception.

3. **Tympanites.** The almost incredible blunder has occasionally been made of mistaking tympanites for an abdominal tumor. This has usually occurred when the evidences of percussion and palpation were obscured by large amounts of abdominal fat. Tympanites will be known by resonance on percussion, absence of the percussion wave, and by the negative results of vaginal touch.

4. **Fecal accumulations** in the bowel have occasionally led to the suspicion of an ovarian cyst. The history of constipation, supplemented by palpation, will clear the diagnosis; if not, active catharsis will remove all doubt.

5. **Distended Bladder.** Retained urine may accumulate in large quantity until the bladder appears between the pubes and umbilicus as a distinct fluctuating tumor. The external appearance, on inspection, palpation, and percussion, is very like ovarian cystoma. The anterior vaginal wall, however, bulges into the vulvar orifice. There is an almost or quite continuous overflow of urine through the urethra. Hypogastric pain and distress are urgent. The use of the catheter will settle all possible doubt.

6. **Dilated Stomach.** The author personally knows of one case in which a deservedly eminent surgeon opened the abdomen for a supposed ovarian cyst, and found instead a dilated stomach. The condition would be distinguished from ovarian cyst by the maximum enlargement above instead of below the umbilicus, and by resonance on percussion all over the tumor. A positive test is to let the patient swallow water while the stethoscope is placed over the tumor. As the water reaches the stomach its gurgling sound will be clearly heard all over the enlargement.

Given sufficient evidence that there is a tumor, the next inquiry is—

QUESTION II.: Is the enlargement of pelvic or of abdominal origin?

If not of pelvic origin it cannot be ovarian, and therefore does not come within the scope of this inquiry. If the hand cannot be inserted by deep firm pressure between the tumor and the symphysis pubis, it is inferred that the tumor rises from the pelvis; if the vaginal and rectal touch confirm this inference, it is so decided.[1] The pelvic origin of the tumor being established, the next inquiry is—

QUESTION III.: Is the tumor possibly due to pregnancy?

The humiliation of attempting to remove from a pregnant woman an ovarian tumor which does not exist may be avoided by assuming, until the contrary is proved, that every abdominal enlargement is due to pregnancy.

[1] Adaptation from Peaslee's Ovarian Tumors.

Differential Diagnosis of Normal Gestation and Ovarian Cyst.[1]

Normal Gestation.	Ovarian Cyst.
1. Enlargement sudden, rapid, and usually symmetrical.	1. Enlargement gradual and, until tumor becomes large, asymmetrical.
2. Facies natural and healthy.	2. Facies ovariana. Page 413.
3. Superficial veins of abdomen not enlarged. Œdema of ankles not uncommon after seven months.	3. Veins enlarged. Œdema exceptional and only after one or two years.
4. Fluctuation not distinct unless liquor amnii is excessive.	4. Usually very distinct, especially in monocysts.
5. Menstruation arrested.	5. Not usually arrested unless late in the disease.
6. Vaginal touch detects softening and apparent shortening of the cervix and enlargement of the uterus. No extra-uterine tumor.	6. Uterus unchanged except by displacement, usually in front of or behind the cyst. Tumor extra-uterine.
7. Ballottement gives impulse of fœtus.	7. Ballottement gives negative results.
8. Fœtal heart sounds after twentieth week.	8. None.
9. Fœtal movements about sixteenth week.	9. None.
10. Enlarged sebaceous glands and areola about nipples darkened.	10. Rarely imitated.
11. Tumor has developed in six to nine months.	11. Development continues one to three years.

If the fetus is dead, the heart sounds and fœtal movements will, of course, not be present.

Ovarian cyst and pregnancy not infrequently coexist. The diagnosis is then made by the clinical history of both conditions, by palpation, and by conjoined examination.

Hydramnios is an excess of amniotic fluid. There is normally from six to thirty ounces; this amount may be increased enormously, giving the uterus the appearance of an immense cyst. The attempt has occasionally been made to tap or remove such a tumor by mistake for an ovarian cyst.

The differential diagnosis of hydramnios and ovarian cyst is as follows:

Hydramnios.	Ovarian Cyst.
1. Evidence of pregnancy.	1. Not usual.
2. Rapid development.	2. Slow development.
3. Ballottement.	3. Absent.
4. Distention symmetrical.	4. Distention on one side.

Tubal Pregnancy. The diagnosis of this condition will be found in Chapter XXXVI. Unlike ovarian cyst, it gives an early, though irregular, history as of normal pregnancy. Conjoined examination before rupture shows a boggy, fluctuating, pulsating tumor at the side and back of the uterus. After rupture the tumor is less distinct, non-pulsating, and non-fluctuating. At or near the time of rupture the endometrium throws off a modified decidua of pregnancy. The symptoms of rupture are urgent; they are those of pelvic hæmatocele, and are not likely to be mistaken for any symptoms of ovarian cyst unless it be those of rupture of the sac or twisting of the pedicle.

Gestation in One Horn of a Bifurcated Uterus. The unilateral location may give bicornate pregnancy the appearance of an ovarian cyst or of a myoma.

[1] Adaptation from Peaslee's Ovarian Tumors.

QUESTION IV.: Is there a uterine enlargement due to other causes than pregnancy?

The pathological conditions suggested by the question are these:

Uterine myoma.	Hæmatometra.
Uterine sarcoma.	Hydrometra.
Uterine carcinoma.	Pyometra.
Metritis.	Physometra.

Differentiation of Uterine Myoma from Ovarian Cystoma.[1]

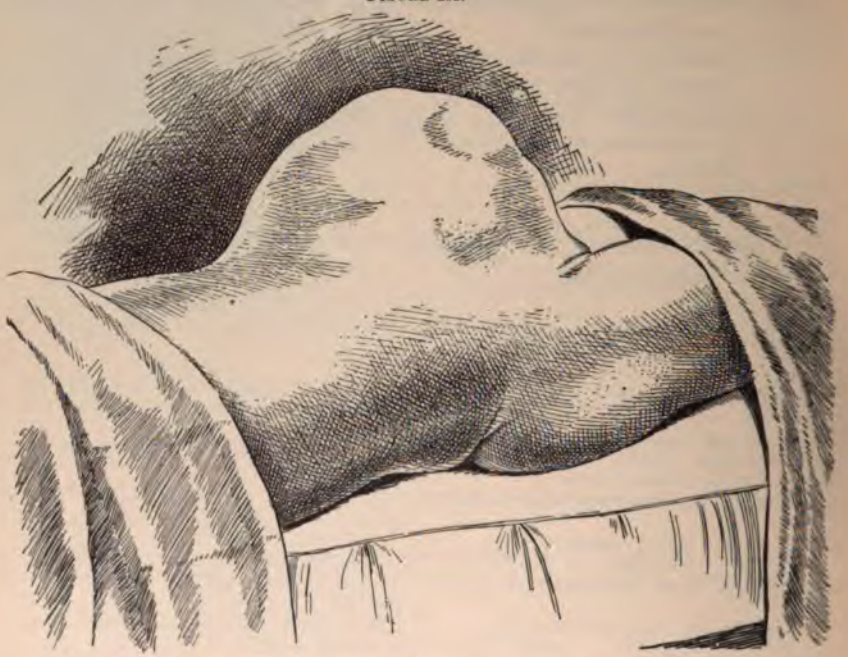
UTERINE MYOMA.	OVARIAN CYSTOMA.
1. Slow growth.	1. Usually more rapid growth.
2. Facial expression unchanged. Face may be full and flushed; later pale from hemorrhage.	2. Facies ovariana.
3. General health usually unimpaired except from loss of blood. If submucous or mural, may be painful.	3. General health early impaired from emaciation. Not painful.
4. Abdomen usually very asymmetrical from irregular shape of tumor.	4. Abdomen more symmetrical, especially when tumor is large.
5. Abdominal veins not usually enlarged.	5. Usually enlarged, especially in large polycysts.
6. Action of kidneys normal.	6. Kidneys less active.
7. Usual menorrhagia.	7. Menstruation unchanged or diminished.
8. Elasticity, not fluctuation. No percussion wave.	8. Fluctuation marked. Percussion wave marked.
9. Surface firm and usually lobulated.	9. Surface yielding; in monocysts, regular; in polycysts, irregular.
10. Vaginal touch and conjoined examination show tumor dense and firm, and, unless pedunculated, continuous with uterus. Uterus large and heavy.	10. Uterus normal, except displacement from pressure. Tumor compressible, fluctuating, detached from uterus.
11. Uterine cavity much elongated.	11. Not materially elongated. (This is a most important diagnostic point.)
12. Uterus moves with tumor.	12. Does not move with tumor.
13. Negative results from aspiration.	13. Positive results from aspiration.
Exception.—A subperitoneal myoma with a long pedicle moves independently of the uterus, and the uterine cavity is not necessarily lengthened. If the myoma has degenerated to a fibrocyst, there will be more or less fluctuation, and aspiration may yield positive results.	*Exception.*—A cyst with semisolid contents yields negative results on aspiration. Fluctuation, if present, is indistinct, and percussion-wave is absent or indefinite.

Differentiation of Uterine Sarcoma and Carcinoma from Ovarian Cyst.

The relations of these growths to the uterus are similar to those of myoma. The accompanying tabulated statement concerning myoma, therefore, in the main applies as well to these malignant growths. Malignant uterine tumors differ from myoma in these particulars—viz., more pain, great tendency to early ulceration and other degenerative changes, more profuse hemorrhages, offensive watery or bloody discharge, and a speedily fatal result.

[1] Adaptation from Peaslee's Ovarian Tumors.

FIGURE 265.



Shape of abdomen made by large round, nearly symmetrical, uterine myoma.

Differentiation of Metritis from Ovarian Cyst.

Metritis gives a history of inflammation, and is apt to be associated with parametritis, salpingitis, and ovaritis. The uterus is never enlarged to more than two or three times its normal size, and in form is always symmetrical. Conjoined examination will show that there is no extra-uterine growth. There are also tenderness on pressure and diminished mobility.

Differentiation of Hæmatometra, Hydrometra, Pyometra, and Physometra from Ovarian Cyst.

The uterine enlargement is always symmetrical, and the organ, whether distended with blood, serum, pus, or gas, gives a greater or lesser sense of fluctuation, but not the clear fluctuation of a cyst. See Retained Menstruation, Chapter XXXVIII. Examination will show that the os externum or the cervical canal at some point is completely closed. Unless the Fallopian tubes are also distended the enlargement will be entirely confined to the uterus.

QUESTION V.: Is the enlargement extra-uterine, and possibly due to inflammation?

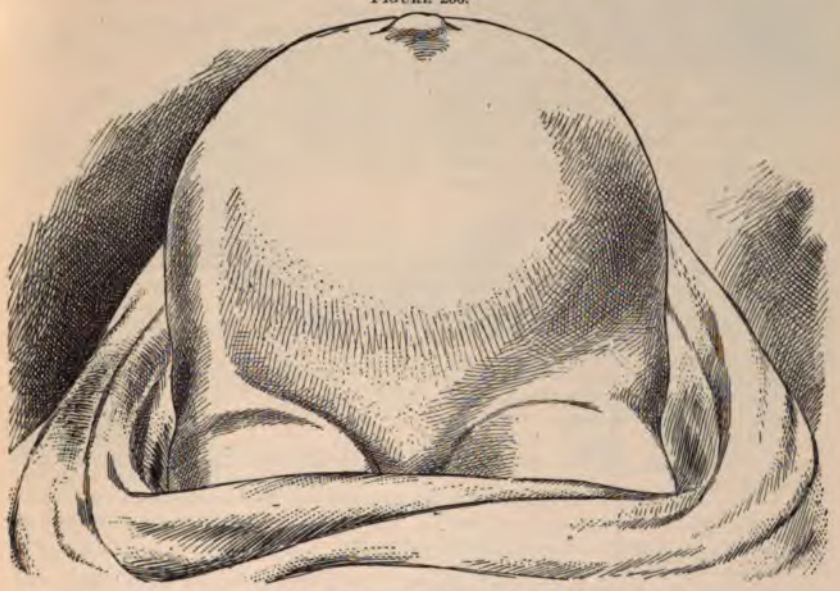
This question suggests the following conditions:

Parametritis,	Pyosalpinx,	Peritonitis,
Pelvic abscess,	Hydrosalpinx,	Pericæcal abscess.

The history of inflammation and the close relations of the enlargement to the uterus will aid greatly in the recognition of any of these

diseases. In all, except possibly hydrosalpinx, there will be great tenderness on pressure. Sactosalpinx, whether the tube be distended

FIGURE 266.



Ovarian tumor with ascites. Observe protrusion of umbilicus.

with serum, pus, or blood, will usually be identified by its location to the side and back of the uterus, but more especially by the irregular, elongated, tortuous, or ovoid form of the mass. A pus-tube is much more likely to be adherent than an ovarian cyst of small size. A parametric abscess is always continuous with the side of the uterus and situated in the broad ligament. Suppuration, anterior or posterior to the uterus, is also inseparable from the uterus. Pericæcal abscess or appendicitis may be suspected from its location.

QUESTION VI.: Is the tumor of abdominal origin, and therefore not ovarian?

A large ovarian cyst may have a pedicle so long as to permit the entire tumor to rise out of the pelvis into the abdominal cavity. It may even be possible to insert the hand deeply between the tumor and the symphysis pubis. Conjoined vaginal and rectal touch may not discover the pedicle, nor establish the pelvic origin of the cyst; it is sometimes difficult to differentiate such a cyst from other tumors of abdominal origin.

The following pathological conditions are suggested:

Ascites.
Encysted ascites.
Hydatid cysts.
Renal cysts.
Displaced or floating kidney.
Pancreatic cyst.
Enlarged liver.
Mesenteric cyst.
Cysts of the urachus.
Enlarged gall-bladder.
Intestinal tumors.
Fatty tumors.

Differential Diagnosis of Ascites and Large Ovarian Cyst.[1]

ASCITES.	OVARIAN CYST.
1. Previous history of visceral disease.	1. No such history.
2. Enlargement comparatively sudden.	2. Gradual.
3. Face puffy; color waxy; early anæmia.	3. Facies ovariana. Anæmia later.
4. Patient on back, enlargement symmetrical; flat in front.	4. Asymmetrical until tumor is quite large; prominent in front.
5. Sitting up, abdomen bulges below.	5. No appreciable change.
6. Navel prominent and thinned.	6. Navel usually unchanged.
7. Fluctuation decidedly clear, diffuse throughout abdomen, but avoids highest parts in all positions, and always has a hydrostatic level.	7. Less clear; limited to cyst; not modified by change of position. No hydrostatic level.
8. Intestines float on top of fluid; hence percussion gives clear tympanitic note over the highest parts of abdominal cavity, and dulness in lowest parts for all positions—*i. e.*, areas of resonance and dulness change with position.	8. No change in areas of dulness and resonance with change of position. Dulness over cyst. Clear resonant note in all parts beyond cyst limits—*i. e.*, in flanks and toward the diaphragm.
9. Vaginal touch detects fluctuation, bulging into vagina.	9. Vaginal fluctuation less clear or absent.
10. Uterus in prolapsed location, but position unchanged. Size and mobility unchanged.	10. Uterus displaced forward or backward, or laterally by pressure of cyst.
11. Hydragogues and diuretics temporarily remove the fluid.	11. Medicines have no effect.
12. Fluid light straw color and thin. Coagulates spontaneously.	12. Fluid light or dark and of varying consistency; albuminous, but does not coagulate spontaneously; may contain colloid matter.
Exceptions.—The intestines may be adherent to the posterior part of the abdominal cavity, and the fluid may therefore be in the anterior part, or the amount of fluid may be so great that the intestines held back by mesentery or adhesion cannot float to its surface; then the areas of resonance and dulness, except on very deep percussion, may be similar to those of a cyst.	*Exceptions.*—Flanks may be dull from feces in the colon.
Gas in the colon may produce clearness in the flanks.	Cyst may communicate with the intestines and be filled with gas. This would give a tympanitic note all over the cyst.
Encysted ascites—*i. e.*, fluid confined to a limited part of the abdomen by adhesions—may give the same areas of dulness and resonance as a cyst.	The cyst may be small and glued to the posterior part of the abdominal cavity by adhesions. The intestine might then be in front of it and give a tympanitic note over the most prominent part of the enlargement

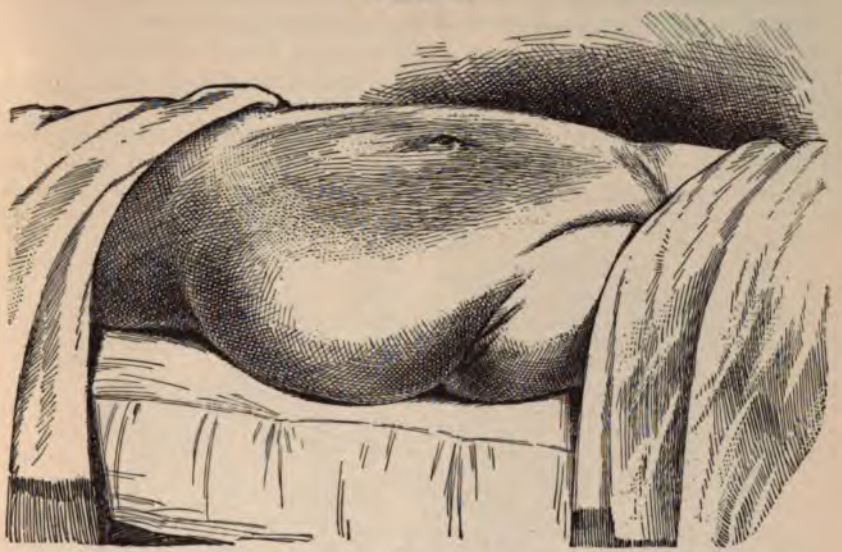
Ovarian cyst and ascites may coexist. If the cyst be small and the patient a stout woman, the diagnosis without exploratory incision may then be most difficult.

Differentiation of Hydatid Cysts from Ovarian Cysts.

Hydatid, or echinococcus, cysts are sometimes difficult to distinguish from ovarian tumors. They may originate either in the pelvis or in the abdomen. Hydatid cysts of pelvic origin may be in the broad ligament or immediately beneath the uterine or pelvic peritoneum. Hydatid abdominal cysts may originate in the omentum or liver. If of abdominal origin and of small size, their location will usually prove them to be extrapelvic, and therefore not ovarian. The qualifying word "usually" is introduced because the writer once encoun-

[1] Adaptation from Peaslee's Ovarian Tumors.

FIGURE 267.



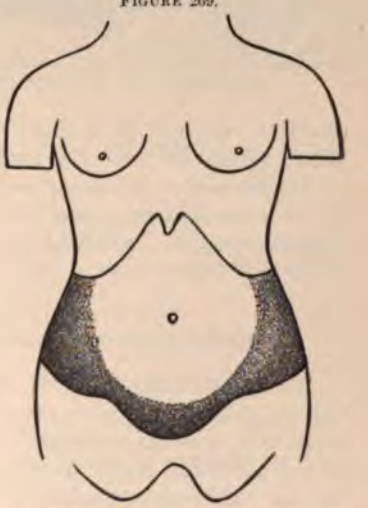
Characteristic shape of this flaccid abdominal wall with ascites.

tered a small ovarian cyst adherent to the liver. The pedicle was in this case very slender and about seven inches long.

FIGURE 268.

Areas of dulness and tympanites in ovarian cyst. Shadow corresponds to dulness.

FIGURE 269.



Areas of dulness and tympanites in ascites. Shadow corresponds to ascitic fluid.[1]

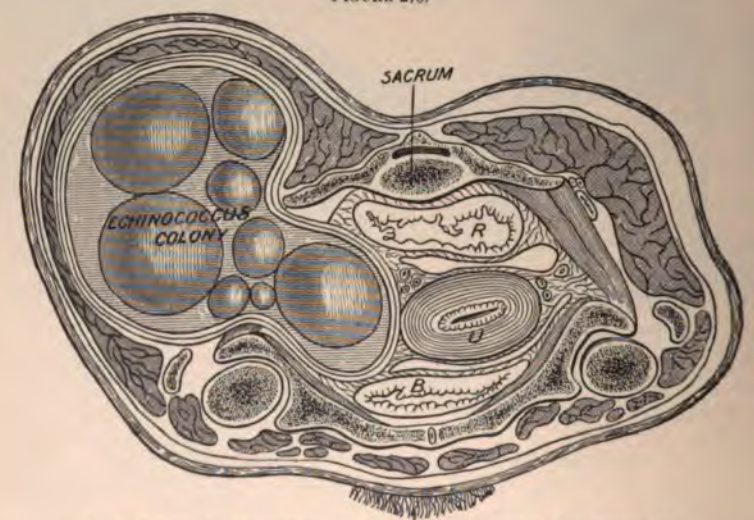
Large abdominal hydatid cysts may extend into the pelvis, and, like those of pelvic origin, closely simulate ovarian disease. These

[1] Fehling. Lehrbuch der Frauenkrankheiten.

cysts unless inflamed are rarely painful. When they distend the abdomen, they project as a mass of small, rounded, tense, elastic bodies; the individual projections are smaller than those of ovarian cysts. Fluctuation is distinct. Suppuration will give rise to signs of an abscess in addition to the signs of hydatids.

Definite diagnosis is impossible without aspiration. The fluid will usually show the characteristic hooklets. It is slightly alkaline or neutral, non-albuminous, has a specific gravity of about 1010, and

FIGURE 270.



Hydatid cyst in the pelvis. *U.* Uterus. *B.* Bladder. *R.* Rectum.[1]

contains chloride of sodium. Fragments of the characteristic laminated lining of the cyst may come away through the aspirator.[2]

Degenerative processes may cause rupture of the cyst and discharge of its characteristic vesicles, hooklets, or membranes through the vagina, rectum, or bladder; the diagnosis is then clear. Hydatid cysts are rare.

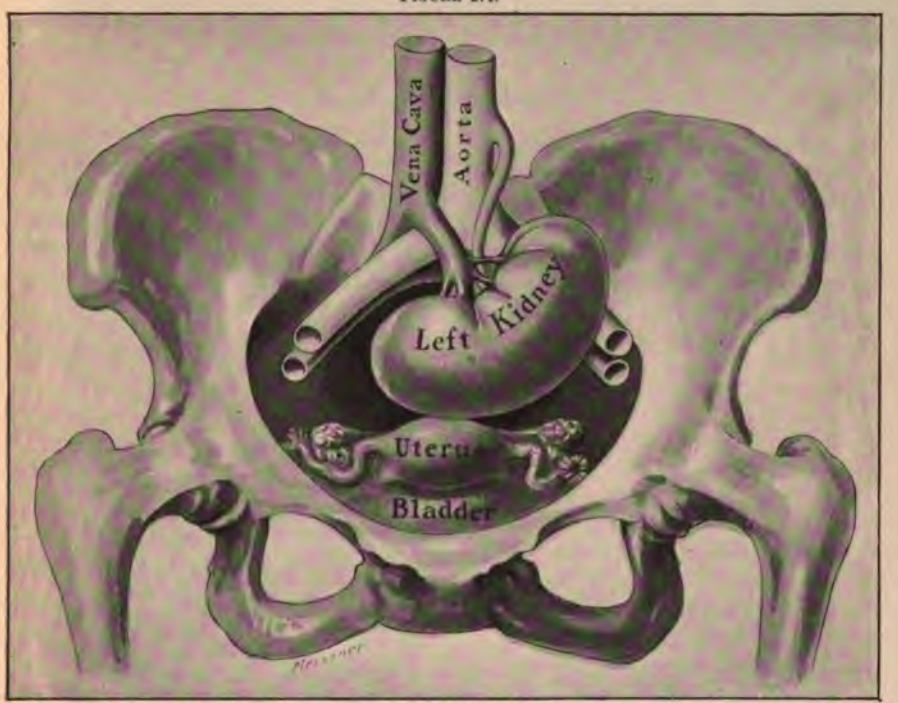
Differentiation of Renal Tumors and Ovarian Cysts.

The distinction between renal tumors and other abdominal and pelvic enlargements is often extremely difficult. They have been repeatedly mistaken, not only for ovarian tumors, but as well for tumors of the pancreas, liver, spleen, intestine, omentum, and uterus. Without an exploratory incision, the greatest care and the widest general knowledge may be inadequate to a diagnosis. The enlarged kidney has been found, not only so loose as to occupy almost any location or position in the abdomen or pelvis, but fixed by adhesions in its mal-location—for example, to the pelvic brim or to the sacrum. In

[1] After Freund.
[2] Adaptation from J. Bland Sutton. Surgical Diseases of the Ovaries and Fallopian Tubes.

such cases the clinical history and rational signs—including urinalysis—will usually give evidence of renal disease. A renal cyst

FIGURE 271.



Left kidney in the hollow of the sacrum; the renal artery and vein are dragged down with the kidney.

may be hydronephrosis or pyelonephrosis. The differentiation is as follows:

HYDRONEPHROSIS.	OVARIAN CYSTS.
1. Enlargement unilateral and from above downward. Growth fixed in region of kidney.	1. Enlargement at first unilateral; later symmetrical and from below upward. No fixation.
2. Expression unchanged.	2. Facies ovariana.
3. Growth usually slow.	3. Growth relatively rapid.
4. Intestines may be in front of tumor.	4. Intestines in the flanks above and back of tumor.
5. Fluid not necessarily albuminous; may contain calculi.	5. Fluid albuminous; no calculi.
6. Vaginal touch negative.	6. Tumor usually felt by vaginal touch.
7. Urine may contain pus, blood, or albumin.	7. Urine generally normal.
Exceptions.—In case of a movable kidney the tumor may not be fixed.	*Exceptions.*—In case of adhesions the cyst may be fixed.

In pyelonephrosis the symptoms of suppuration will also be present.

Pancreatic cyst, enlarged liver, mesenteric cyst, cyst of the urachus, enlarged gall bladder, intestinal tumors, subperitoneal or omental fatty tumors, all of which may grow to large size, have been mistaken for ovarian cysts. With ordinary care and skill, however,

are not very likely to arise. All these tumors develop ownward, and may usually be distinguished from ovarian location and physical characteristics. They do not pro- ies ovariana, and, unlike ovarian cyst, are usually beyond vaginal touch.

Exploratory Incision.

Finally, in cases of doubt, the question may be settled by exploratory incision. Indeed, every ovariotomy—yes, every abdominal section—should begin as an exploratory incision. Mr. Tait's wise caution, already quoted in connection with the diagnosis of pelvic inflammation, will bear repetition here: "One may easily turn an exploratory incision into a complete operation, but it may be a serious matter to turn an incomplete operation into an exploratory incision."

CHAPTER XXXIV.

OVARIOTOMY.

THE general principles which apply to this operation are fully laid down in Chapters III., VI., VII., VIII., and to avoid repetition may be studied in those chapters.

Electricity, incision and drainage, and numerous drugs have been tried in the treatment of ovarian cysts; they are all useless. The treatment is summed up in a single word—ovariotomy. The operation was first performed in 1809 by an American surgeon, Ephriam McDowell, of Danville, Ky.

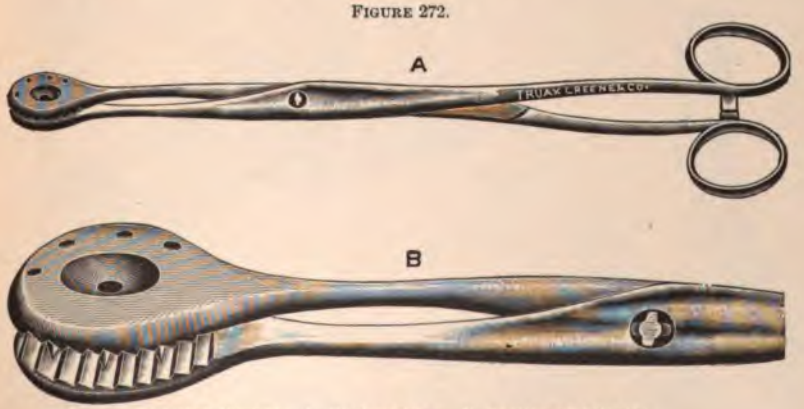
Removal of the Ovarian Cyst.

The subdivisions of the subject are these:

Preparatory treatment.
The abdominal incision.
Emptying and delivering the cyst.
Ligature of the pedicle.
Closure of the wound.
Drainage.
After-treatment.
Accidents and complications.

The Preparatory Treatment and arrangements for the operation, including the selection of sponges, ordinary instruments, operating-

FIGURE 272.



Nélaton forceps. A. Reduced size. B. Section of full size.

table, and assistants, have been outlined in the General Consideration of Major Operations, Chapters II. and VI. The instruments and appliances specially required are:

EXPLANATION OF PLATE XVII.

OVARIOTOMY.

A. **Examining the Tumor.** The abdomen having been opened by an incision in the median line, the hand is introduced into the peritoneal cavity in order to determine the presence or absence of adhesions, and to break up any slight adhesions which may be found.

B. **Tapping the Cyst.** The patient is on the right side. A folded, flat gauze sponge is partially introduced into the peritoneal cavity and held by the left hand of the operator, in order to absorb any fluid which may escape from the cyst. The operator, with his right hand, plunges the trocar into the cyst. The fluid is evacuated through the trocar and the attached rubber tube into the bucket below.

PLATE XVII.

16 Small pressure-forceps, Figure 85.
6 Long pressure-forceps, Figure 86.
2 Nélaton forceps, Figure 272.
1 Scalpel.
2 Pairs of straight scissors, long and short.
1 Ovariotomy trocar, Figure 273.
12 Needles for closing the abdominal wound.
Drainage tubes.
12 Short needles, round at the point, for intraperitoneal plastic work, Figure 74.
1 Rubber sheet.
1 Bucket to catch the cyst fluid.
1 Small, curved trocar.
4 Retractors.

The Abdominal Incision. Ovariotomy, except for small, non-adherent cysts, is performed by abdominal section. The incision is made through the abdominal wall in the median line near the pubis;

FIGURE 273.

Emmet's ovariotomy trocar. Reduced size.

it has already been described in Chapter VI. Vaginal section, sometimes used for very small cysts, is described in Chapter XXIII. Ordinary, uncomplicated ovariotomy requires an incision not more than two or three inches long.

Emptying and Delivery of the Cyst. As soon as the peritoneal cavity is opened, the cyst, of peculiar blue or grayish-white color, is seen directly through the opening. The cyst being exposed, the assistant turns the patient partly on the side, so that the abdomen will be directed toward the operator, and holds her steady. The trocar, with an attached rubber tube, is then thrust through the cyst-wall, and the fluid is drawn off into a bucket provided for the purpose.

As soon as the fluid begins to flow the cyst-wall is seized close to the trocar with the Nélaton or long forceps—one or two pairs—and as the sac empties the collapsing walls are rapidly drawn through the abdominal wound. A non-adherent monocyst with thin walls is usually delivered in this way with great ease.

In case of a polycyst, the point of the trocar may, without complete withdrawal, be successively thrust into one compartment after another until all are emptied and the collapsed sac is delivered.

The obstacles to the delivery of the sac are: 1. Secondary cysts. 2. Semisolid or semifluid contents, and solid portions of the cyst. 3. Adhesions.

The secondary cysts may be too numerous to be tapped by the trocar. Delivery may then be accomplished through a larger incision, or, the trocar having been withdrawn, one or two fingers, and, finally,

Explanation of Plate XVIII.

A. As the fluid passes from the cyst through the trocar and the sac begins to collapse, the trocar is placed in the hands of an assistant, and the operator with a heavy long forceps in each hand seizes the sac on either side of the trocar at points *a* and *b*, and makes steady traction, so that, as the sac is emptied and collapsed, it may be drawn out through the abdominal incision. The sac is seized successively at different points by first one forcep and then the other until it is delivered. The delivery of the sac in this manner by traction would usually be rendered impracticable or impossible by adhesions; see Plate XVII., *A*.

B. The sac has been emptied or nearly emptied. The wound in the sac wall made by the trocar is temporarily closed by the Nélaton sac forceps *c*. Forceps *a* and *b*, by which the sac has been drawn through the abdominal incision, are hanging upon the cyst wall. The pedicle is clamped by two strong forceps, *c* and *d*, which are then placed in the hands of the assistant, and the pedicle is divided between them by means of scissors in the right hand of the operator, while his left hand holds the tumor steady.

PLATE XVIII

the left hand, introduced into the sac breaks up the partitions between the secondary cysts—as it were, eviscerates the cysts. During this manipulation the forceps in the right hand must keep the opening in

FIGURE 274.

Small, curved trocar for emptying small cysts. Reduced size.

FIGURE 275.

Retractor for drawing apart abdominal wound. Reduced size.

the cyst-wall drawn well outside of the abdominal incision. This is important, in order to prevent escape of the cyst-fluid into the abdomen.

Semisolid or semifluid contents found in dermoid and colloid cysts will not run through the trocar. Often tumors are partly cystic and partly solid. A longer incision is necessary for the delivery of such non-collapsible tumors. This is made upward and to the left of the umbilicus, with scissors and the left index-finger as a guide.

Adhesions are the most common obstacle to the easy delivery of the sac. They may be parietal or visceral. The general technique in adhesions is described in Chapters VI. and XXIII. The cyst should usually be tapped and the fluid drawn off before the adhesions are broken. The different parts of the sac from which adherent intestine, omentum, and other structures are to be separated may usually be brought successively into the opening, and the adhesions broken until the tumor is free. If this cannot be done, the incision is lengthened and the adhesions separated *in situ*. In loosening adhesions it is well to secure bleeding points, as they occur, by forcipressure, or torsion, or fine catgut ligatures. The tumor having been freed, the operation proceeds as already described for non-adherent tumor.

Ligature of the Pedicle. The cyst having been drawn through the abdominal incision, the pedicle is tied with catgut close to the horn

Explanation of Plate XIX.

A. If the sac is adherent to adjacent structures, the adhesions must be broken before it can be delivered through the abdominal wound.

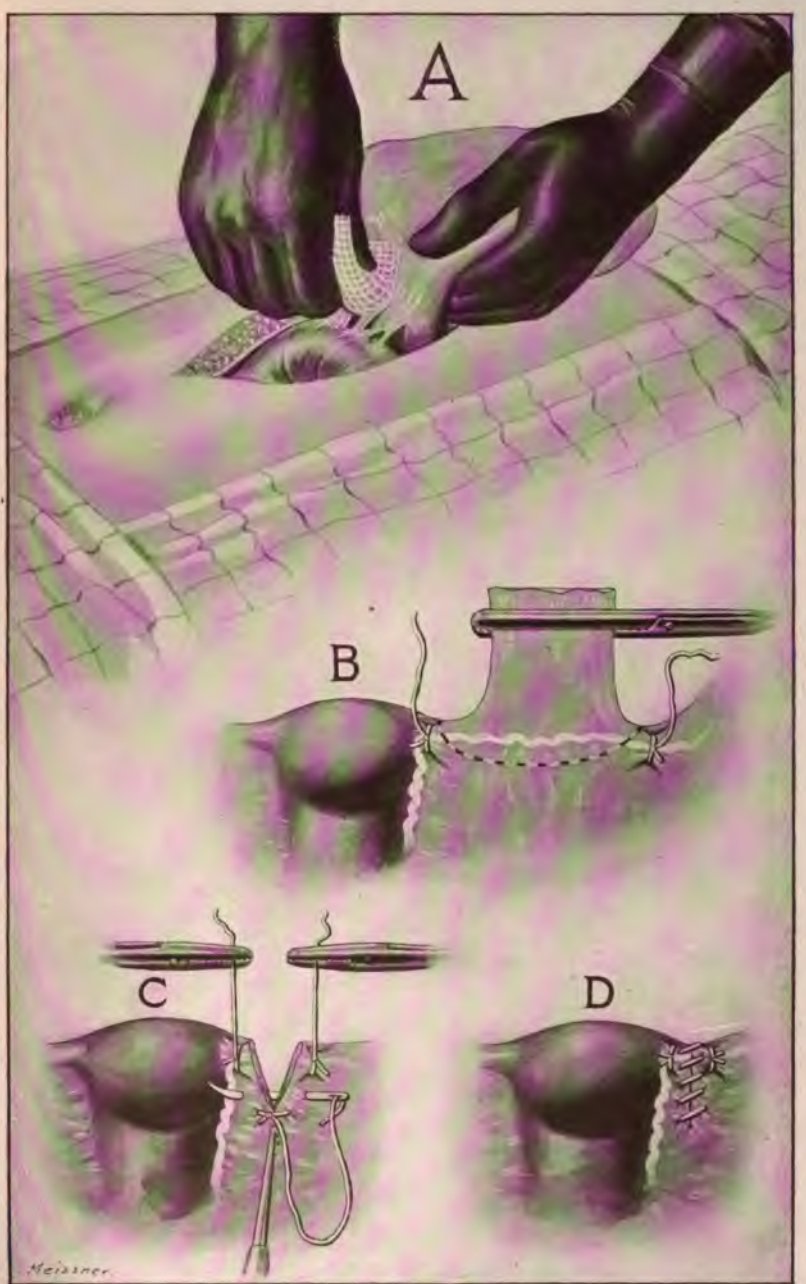
Adhesions are here shown between the sac and the intestine, and are being brok up by strong pressure with the sponge in the right hand of the operator while his l hand holds the sac. Very extensive and firm adhesions may be separated—spong off, as it were—in this way.

B. The sac has been delivered through the abdominal incision, the pedicle clamp and the tumor removed. The pedicle is here shown temporarily clamped by a stro forceps. This forceps corresponds to forceps *c*, Plate XVIII., *B*. Two strong ligatu *en masse* have been introduced and tied one on each side of the pedicle. These ligatu control the ovarian vessels. The black and white dotted line shows where the incisi for the removal of the pedicle is to be made.

C. The pedicle has been removed by an incision along the dotted line shown *B*. The ligatures which surround the ovarian vessels *en masse* are being held taut ea in a pressure forceps, while a tenaculum makes downward traction on the centre of t cut edge of the broad ligament. This shows the cut edge folded and being unit upon itself by a continuous suture.

D. The suture uniting the wound in the broad ligament is completed. For a fu description of the technique of this procedure, see Figures 175, 176, 177, and 178.

PLATE XIX.



of the uterus, and the tumor cut off with scissors about one inch from the ligatures. The tumor having been removed, hæmostasis should be secured by suture of the broad ligament, as described for the removal of the uterine appendages in Chapter XXIII., and illustrated in Plate XVII.

Cyst fluid may be perfectly innocent, or, on the contrary, may, from suppuration or other causes, contain infectious matter. The thick, gelatinous contents of colloid and of dermoid cysts are usually infectious, and, if brought in contact with the peritoneum, may cause dangerous infection. In order to avoid such contamination it is often safer, when the fluid is known to be infectious, to make a long incision and deliver the tumor intact without attempting to puncture the cyst and draw off the fluid.

Closure of the Wound, Drainage, and After-treatment. These subjects have been fully considered in Chapters VI., VII., and VIII.

The Accidents and Complications[1] are such as may occur in abdominal sections for any purpose.

Extrusion of the bowel during operation should be prevented by the assistants; if it occur, the bowel should be immediately returned and held by broad gauze pads or towels.

Stripping of the parietal peritoneum from the abdominal wall, under the impression that it is an adherent cyst, may occur even to the experienced operator. Peritoneum thus detached is apt to slough; and therefore, if not too extensive, should be removed with the tumor; if it is not removed, there should be drainage of the space between the detached peritoneum and the subjacent structures.

Rupture of the cyst wall and escape of its contents are harmless if the fluid is innocent; unfortunately, the thin, friable, gangrenous cysts that are apt to contain infectious fluids are the ones most liable to rupture. The clear indication after rupture is thoroughly to irrigate the cavity with normal salt solution—six-tenths of 1 per cent. If there is anticipation of rupture, one may pack sponges around and under the cyst to absorb the fluid as it escapes.

Injuries to the intestines, ureter, or bladder are sometimes unavoidable. The bowel is specially liable to be opened in breaking up adhesions. In operating deep in the pelvis, the bladder or ureter may be cut even by a careful operator. Injury to the intestine or bladder should be immediately repaired by suture. If the ureter has been cut, the surgeon will have recourse to one of the following procedures: 1. The cut ends may, if practicable, be reunited by end-to end approximation after the method of Weller Van Hook. 2. The attempt may be made to turn the ureter into the bladder. 3. The ureter may be brought out through the abdominal wound. 4. The kidney on the affected side may be removed.

Foreign bodies left in the abdomen, such as sponges, forceps, and other instruments, have caused numerous deaths, not only after ovariotomy, but after many other abdominal operations. See Chapter VI.

Intestinal obstruction, the principles of drainage, and the after-treatment have been presented in Chapters VII. and VIII.

[1] Allbutt. System of Gynecology.

Removal of Intraligamentous Cysts.

...ic, parovarian, and even simple ovarian cysts may de... in the folds of the broad ligament. They are then called ...entous. The genesis and the mode of development of these ... been fully described. The parovarian cyst is easily peeled ... broad ligament. The paroöphoritic and other papillomatous cysts may, if intraligamentous, present the greatest difficulties in removal. Such tumors often lie deep and firmly fixed in the substance of the broad ligament, and are therefore hard to enucleate.

Before attempting the enucleation two ligatures should be applied, one on the infundibulo-pelvic ligament, the other on the uterine end of the broad ligament. The first ligature cuts off the ovarian artery as it enters the pelvis; the second, if deeply placed, cuts off the utero-ovarian anastomosis. These ligatures deprive the broad ligament and included tumor of a great part of their blood-supply, and the frightful hemorrhage sometimes encountered in the removal of a papillomatous intraligamentous cyst may be therefore measurably avoided. In order to control hemorrhage, one should be prepared, if necessary, to ligature also the uterine vessels, or even to remove the uterus.

The tumor may be removed, according to its depth, in one of two ways: If it is not very deep, and lies rather loosely in the broad ligament, the ligament and cyst sometimes may be excised and removed together. This procedure is very much like that described in Chapter XXIII. for the removal of the uterine appendages without a pedicle. The other method is that of enucleation. This is sometimes an extremely difficult and hemorrhagic operation. As the enucleation proceeds the bleeding points, so far as possible, are secured by fine catgut ligatures. The sac having been removed, the raw bleeding surfaces between the folds of the broad ligament are temporarily packed with hot gauze sponges to stop the oozing. The redundant portions of the ligament may be trimmed off with the scissors, the edges may be turned in and united with deep interrupted or continuous sutures. If the cavity from which the sac was enucleated is too large to be obliterated by inversion, as above described, or the oozing from its surface is uncontrollable, an opening may be made from the bottom of the cavity close to the uterus directly into the vagina. The end of a long strip of gauze may be carried through this opening into the vagina, the cavity packed full, and the edges of the broad ligament closed over it. This leaves the bleeding part entirely covered by peritoneum, renders the raw surfaces extraperitoneal, controls hemorrhage, and provides for drainage. Care to avoid the ureters is necessary in the enucleation, in the placing of deep ligatures, and in the incision into the vagina. The ureters are sometimes situated dangerously near the field of operation. The gauze drain, which is the same as that described in Chapter XXVII., may be removed through the vagina in two or three days.

Ovariotomy During Pregnancy.

An ovarian tumor complicated by pregnancy gives rise to the following dangers: 1. Twisting of the pedicle. 2. Abortion. 3. Obstruction to labor, necessitating Cæsarean section or ovariotomy during labor. From these and other possibilities the danger to the life of the child and the mother is extreme. The danger of timely ovariotomy before labor, as compared with that of the expectant treatment, is relatively small. The indication for early ovariotomy, therefore, is generally clear. Puncture of the cyst, as a substitute for ovariotomy, is permissible only when ovariotomy is impracticable. The chief danger of both puncture and ovariotomy is from possible sepsis and consequent abortion or premature labor. In the complication of pregnancy the necessity for an early, rapid, gentle, clean ovariotomy is apparent. The pedicle always contains large vessels, and should therefore be tied with special care. Moderate doses of codeine may be useful in the after-treatment.

CHAPTER XXXV.

OF THE FALLOPIAN TUBES, BROAD LIGAMENTS, ROUND LIGAMENTS, AND URINARY ORGANS.

Tumors of the Fallopian Tubes.

THE tumors of the Fallopian tubes include myoma, adenoma, adenomyoma, cysts, carcinoma, and sarcoma.

Myoma of the tube rarely occurs, seldom obstructs the oviduct, and is commonly too small to be of clinical significance. One case, however, is reported in which the tumor reached the size of a child's head.[1] Salpingitis isthmica nodosa and tubercular salpingitis have been mistaken for myoma of the tube.

Adenoma, as termed by J. Bland Sutton,[2] or papilloma, as first described by Doran,[3] is not uncommonly found. The growth usually begins as a small papilloma or wart, and may attain the size of a large orange. It may present the appearance of a so-called hydatid mole, a multiple cyst, or a cauliflower growth. A frequent complication, according to Sutton, is hydro-peritoneum. This results when the abdominal end of the tube is open and the secretion passes from the tube into the peritoneum. When the abdominal end is closed and the uterine end open there may be a bloody discharge through the uterus. Adenomata frequently undergo malignant degeneration; early removal of the tube is therefore indicated.

Adenomyoma. This is characterized by a small nodular enlargement of the tube. It has been fully described by Recklinghausen, and later by Ries, as originating in the remnants of the Wolffian body. The various nodular enlargements of the tube, including adenomyoma, may be caused by a number of pathological conditions. The differential diagnosis between them must be made by the microscope. They cannot be distinguished by clinical examination.

Cysts of the tube are of frequent occurrence, but of little clinical importance. Small pedunculated cysts, known as hydatids of Morgagni, are often to be found at the fimbriated extremity. Numerous minute cysts with thin walls are frequently seen on the mucous surface of the tubes.

Carcinoma, as a primary growth, is very rare in the tube, and, when present, is usually the outgrowth of adenoma. Secondary carcinoma may be the result of extension from the ovary or the body of the uterus. It is seldom, if ever, secondary to cancer of the cervix without first involving the body of the uterus.

Sarcoma of the tube is exceedingly rare, and its origin obscure.

[1] Sir J. Y. Simpson. From System of Gynecology, Playfair and Allbutt.
[2] Surgical Diseases of the Tubes and Ovaries. J. Bland Sutton.
[3] Transactions of the Pathological Society of London, vol. xxxi., p. 174. Surgical Diseases of the Tubes and Ovaries. J. Bland Sutton.

Tumors of the Broad Ligament.

Tumors of the broad ligament include myoma, lipoma, cystoma, carcinoma, and sarcoma.

Myoma and Lipoma are pathological curiosities and do not grow to large size. The other growths have already been described.

Tumors of the Round Ligament.

Tumors of the round ligament include myoma, fibroma, cyst or hydrocele, sarcoma, and carcinoma.

Myoma and Fibroma, according to Coe, are more common in multipara, and more frequent on the right than on the left side. The

FIGURE 276.

Fibro-myxoma fimbriarum tubæ cystosum.[1]

U. Uterus.
T d. Right tube.
O d. Right ovary.
T s. Left tube.
I ts. Left infundibulum of the tube.
O s. Left ovary.
T, *I.* Pedunculated tumor.
T, *II.* Pedunculated tumor.
T, Secondary pedunculated tumor.
O v. Calcareous body resembling an ovary.
X. Cyst containing dark-yellow fluid.
Y. Gelatinous tissue without cavities.
I. Blood-cyst with blood detritus.
II. Blood-cyst with fresh blood.
III. Soft myxomatous tumor.
IV. Soft myxomatous tumor.

growth may be intraperitoneal or extraperitoneal. Myoma is commonly pedunculated, hard, of slow growth, painless, not tender to pressure, and may be either smooth or lobulated. When large it may cause pressure symptoms; if extraperitoneal, it may be found in the inguinal canal or in the labium majus. No impulse upon coughing or straining is transmitted by the tumor. Reduction of the growth is impossible unless small and near the internal inguinal ring. During pregnancy it may rapidly increase in size.

The *diagnosis* is from ovarian and omental hernia, enlarged inguinal glands, and cysts of the glands of Bartholin. *Ovarian hernia* is dif-

[1] From August Martin. Die Krankheiten der Eileiter.

ferentiated from myoma of the round ligamant by its ovoid form, tenderness on pressure, possibility of reduction on pressure, and by its increase in size during menstruation. *Omental hernia* may be as hard as myoma and impossible to recognize without an exploratory incision. *Enlarged inguinal glands* are distinguished by the history of infection and by the lobulated outline. *Cysts of the glands of Bartholin* are distinguished by their location. In myoma the tumor originally lies above the location of the glands of Bartholin. Exploratory puncture will serve to identify the cyst. The treatment is extirpation.

Cyst or Hydrocele is supposed to be developod within the canal of the embryonic round ligament, the embryonic ligament being hollow instead of solid. It may appear in the form of several cysts, or of a collection of fluid either within the inguinal canal or at the external ring. Schröder reports a case in which there seemed to be a communication between the cyst and the peritoneal cavity; at least the fluid could be forced by pressure inside the abdomen. The writer has never observed a case of hydrocele in the round ligament.[1] The differential diagnosis is from myoma of the cord and inguinal hernia. From *myoma* it is distinguished by the sense of fluctuation and by exploratory puncture. From *hernia* the growth is distinguished by not transmitting an impulse on coughing, by failure to reduce by taxis, and by fluctuation. The treatment is extirpation of the sac and direct suturing.

Sarcoma and Carcinoma are so rare as to be of interest chiefly as pathological curiosities.

Tumors of the Urethra.

The principal varieties of urethral tumor are caruncle, mucous polypus, condyloma, wart, carcinoma, and sarcoma. The most frequent seat is the meatus urinarius. Carcinoma and sarcoma are apt to occur by extension from the vulva or vagina.

Urethral Caruncle. This not uncommon growth is a small, soft, red, friable mass situated usually at the margin of the meatus and on its vaginal side. It may, however, be anywhere in the urethra. The growth occurs in nervous, irritable women; and, though no age is exempt, it is most frequent at or near the menopause. There is often a previous history of pelvic disease. Contact of the part with irritating discharges from above is among the commonly assigned causes. Microscopic examination of the growth shows the papillary layer of the urethral mucosa to be softened and atrophied. For this reason the walls of the capillaries are deprived of their natural support, and therefore dilate. This explains the vascularity and the tendency to bleed. The nerve filaments are exposed, and therefore abnormally sensitive. These histological facts explain the friability, vascularity, and hyperæsthesia. The sensitiveness in these growths is often so extreme as to cause the greatest agony on urination. There is great vascularity, which may cause bleeding even upon light touch. The *differential*

[1] Adapted from Coe, in Keating and Coe's Clinical Gynecology.

diagnosis from inflammation of Skene's glands has already been discussed in Chapter XXIV. The *treatment* is excision with the scissors under the base of the growth, and union of the wound by suture.

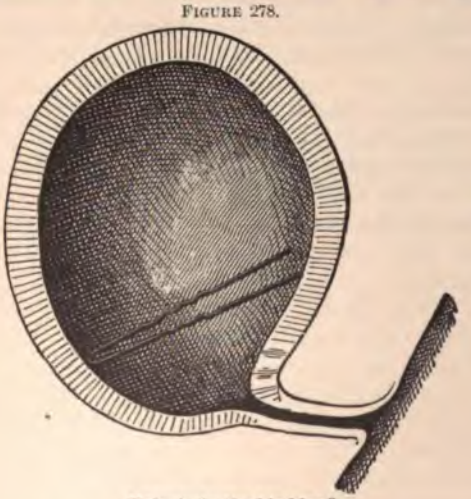
FIGURE 277.

Stone in the bladder.[1]

The cautery is commonly used, but is disapproved on account of its unnecessarily destructive and cicatricial effects.

Warts, Mucous Polypi, Carcinoma, and Sarcoma follow the

FIGURE 278.



Hairpin in the bladder.[2]

same principles of pathology, diagnosis, prognosis, and treatment as when they occur in the vulva.

[1] Auvard. [2] Ibid.

Tumors of the Bladder.

Tumors originating in the bladder are rare. They occur much less frequently in the female than in the male bladder.

Benign tumors, especially if polypoid, are easily removed through an artificial vesico-vaginal fistula. Hæmostasis may, if necessary, be

FIGURE 279.

Tumor in the bladder.[1]

secured by leaving the forceps for a time on the stump. A sessile growth, on account of its inaccessibility and its hemorrhagic tendencies, is much more difficult of removal. Diagnosis is made by cystoscopy.

Malignant disease is almost always an extension from the cervix uteri. The treatment is wholly palliative.

The differential diagnosis of vesical tumors is from stone and other foreign bodies in the bladder. Figures 277, 278, and 279 show a stone, a hairpin, and a tumor in the bladder.

[1] Auvard.

CHAPTER XXXVI.

TUBAL PREGNANCY.

TUBAL pregnancy includes all forms of gestation that originate outside of the uterine cavity. The old idea, that extra-uterine pregnancy comprised three types—viz., tubal, ovarian, and abdominal—has become obsolete; no authentic case of gestation originating in the ovary or upon the peritoneum has ever come to light. So far as known, all ectopic gestation originates in the Fallopian tube. Pregnancy in a rudimentary horn of a bicornate uterus is virtually a tubal pregnancy.

Ectopic pregnancy was formerly considered a rare condition. Now we know it to be of relatively common occurrence. Pelvic hæmatocele, formerly attributed to other causes, is now recognized, in the vast majority of cases at least, as being due to rupture of the gestation-sac of tubal pregnancy.

Etiology.

The causes of tubal pregnancy, though they have been the subject of a vast amount of speculation, remain obscure. It is generally conceded that in at least a large proportion of cases normal fertilization of the ovum occurs in the Fallopian tubes. Spermatozoa have been found in the fimbriated extremity of the tube, and it is probably here that they unite normally with the ovum. The diameter of the human unimpregnated ovum is not over two-tenths of a millimetre; that of the tube, two or three millimetres; although after impregnation the ovule rapidly increases in size, yet under ordinary conditions there is ample time for it to pass into the uterus before disproportionate enlargement takes place. The question of the size of the tube, therefore, is not very pertinent to this discussion.

Tubal pregnancy is common after long periods of sterility. This is explained possibly by the fact that the sterility may have been due to chronic salpingitis, which, by thickening of the tube and destruction of the cilia, prevented the normal passage of the ovule to the uterus and at the same time favored the implantation of it in the tube.

According to Webster,[1] tubal pregnancy is explained as follows: In the earlier type of mammalian development the uterus was bicornate—that is, composed of two horns, of which the Fallopian tubes in the woman are mere rudiments. In other words, the uterus consisted of two highly developed Fallopian tubes. In some women even now he believes there is a structural or functional reversion to the ancient type. According to this theory, the stronger the tendency to reversion

[1] Ectopic Pregnancy.

the greater the liability to tubal pregnancy. This might explain the fact of repeated tubal pregnancies observed in the same individual.

Peritonitic adhesions and bands obstructing the tubes are frequent in ectopic pregnancy; but whether they cause the morbid condition or result from it, or are only incidental, is uncertain.

There is considerable authentic literature on the transmigration of the ovum from the ovary of one side to the tube of the other. Both clinical and experimental examples have been well attested in which pregnancy occurred in the tube when the ovary on that side was absent. There has been atresia of one tube and tubal pregnancy in the other, but with the corresponding corpus luteum only in the ovary of the closed side. All this proves that the ovum must have passed across the pelvic cavity to the tube in which it finally lodged. Tubal pregnancy, therefore, may occur under most unfavorable conditions.

The following is a summary of the supposed predisposing causes, none of which accounts satisfactorily for the phenomena:

1. Inflammation of the Fallopian tubes causing:
   - *a*. Desquamation of ciliated epithelium and denuded patches which obstruct the ovum.
   - *b*. Loss of peristaltic action of the tube.
   - *c*. Cicatricial contraction in the tube.
2. Persistence of fœtal type—tube long and tortuous, with small lumen.
3. New formations in and around the tube.
4. Torsion of the tube.
5. Diverticula in the tube.
6. Sterility of long standing.

Formation of Chorion, Amnion, Decidua, and Placenta.[1]

During the first month or six weeks of tubal pregnancy that portion of the tube in which the fertilized ovum is lodged becomes thinner and very vascular and turgid. The mucous membrane becomes stretched and its folds effaced. The changes that occur to the fertilized ovum after impregnation are identical, whether it be in the tube or the uterine cavity. The membranes by which the embryo is enclosed are similar to those in intra-uterine gestation. These membranes can be studied to advantage in the so-called tubal moles, which are similar in origin to uterine moles. The chorion is shaggy with villi, and resembles in gross and microscopic appearances that found in intra-uterine gestation. The villi appear as clusters of circular bodies. The embryo lies within the amniotic cavity, and the structure of the amnion and its relations to the embryo and chorion are almost the same as in intra-uterine pregnancy.

The formation of the placenta in tubal gestation differs in several particulars from one developed in the uterus. In normal gestation the uterine mucosa and the fœtal structures both contribute to the formation of the placenta; but in tubal pregnancy the tubal mucosa

[1] J. Bland Sutton, in Allbutt and Playfair's System of Gynecology.

plays a very insignificant part. A tubal placenta is almost entirely derived from the embryo.

Contrary to Sutton, Webster has demonstrated a decidua in the tube. It is a curious fact that in addition to this tubal decidua, a decidua also forms in the uterus; it is thrown off during false labor, or, if the patient goes to term, is expelled later in small fragments and without pain. This intra-uterine decidua has all the elements of a decidua of normal intra-uterine pregnancy.

The myosalpinx at first undergoes hypertrophy, but soon that portion to which the placenta is attached becomes thinned, and the bundles of muscular fibres are separated; this favors early rupture.

Frequency.

Tubal pregnancy is not infrequent. Indeed, pelvic hæmatocele, which is not uncommon, is almost invariably the result of ectopic gestation. In thirty-five hundred general autopsies Formad found thirty-five ectopic pregnancies, or 1 per cent. This is, perhaps, the largest percentage reported. The extirpation of diseased tubes has brought to light many cases of tubal gestation that would not otherwise have been recognized, and has thereby added to our estimate of their frequency; this estimate is still further increased by microscopic diagnosis of the decidua cast off by the uterus in the spurious labor which always occurs at some period of tubal pregnancy.

Repetition of tubal pregnancies in the same individual has already been noticed. Both tubes may be simultaneously pregnant. Twin tubal pregnancy in the same tube and concurrent tubal and uterine gestation have been reported. There is no absolute rule as to the frequency of the condition on either side. Tubal pregnancy has been reported after extirpation of the uterus, the tube still having a connection with the vagina.[1]

Varieties.

Tubal pregnancies are designated according as the seat of implantation is respectively at the uterine end, the middle region, or near the abdominal extremity of the tube—that is, they are:

1. Interstitial pregnancy.
2. Isthmic pregnancy.
3. Ampullar pregnancy.

The subvarieties will be noticed in describing each type. The primary classification depends upon the original site of implantation, not upon subsequent accidents of development or secondary changes. A normal pregnancy may become extra-uterine by rupture of the uterus, as in a case reported by Leopold,[2] but that does not make it extra-uterine in the sense here considered.

1. Interstitial Tubal Pregnancy. This is by far the least frequent form. Lodgement of the ovum takes place in that part of the tube

[1] Wendiles. Monatschrift für Geburtshülfe und Gynäkologie, 1895. Centralblatt für Gynäkologie, No. 4, 1896.

[2] Archiv für Gynäkologie, lvii., 1896.

which traverses the uterine wall, and t e fœtus develops in a cavity formed in the substance of the uterus This cavity may open into that of the uterus, making a tubo-uterine pregnancy; or it may in rare instances extend outward between the layers of the broad ligaments. Webster[1] concludes that in some cases of interstitial pregnancy the ovum develops in the side wall of the uterus, in a diverticulum formed by the incomplete fusion of Müller's ducts which sometimes occurs in this particular region. Pregnancy in a rudimentary horn of the uterus, although having a pathology of its own,

FIGURE 280.

Ruptured isthmic (intraligamentous) pregnancy of right tube. Third month. **Marked development of decidua in uterus.**[1]

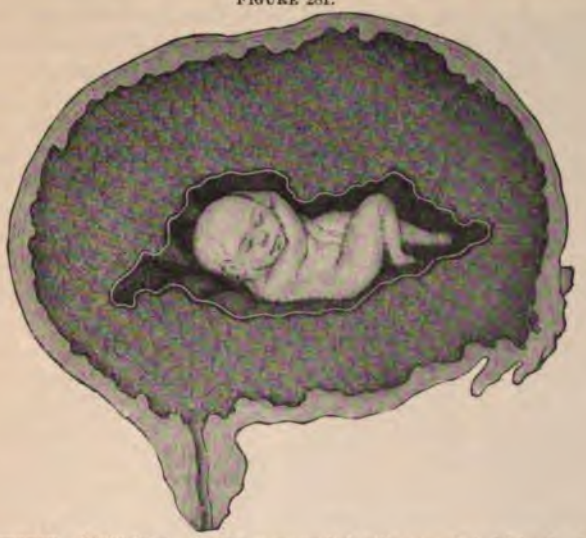
is yet not unlike a tubal pregnancy. The course and outcome of interstitial pregnancy will be noticed later in connection with that of the other forms.

2. **Isthmic Pregnancy** is more frequent than interstitial, less frequent than ampullar, pregnancy. The ovum is lodged in the middle region; and there is generally, before rupture, a spindle-shaped dilatation of the tube. So-called pedunculated tubal pregnancy is possible in this part of the tube, and has in a few cases gone to term. This occurs when the ovum is lodged in a diverticulum or angle of the tube. Under such conditions the walls of the tube may be thick or thin in parts, with consequent greater liability to rupture in the thin parts.

[1] Ectopic Pregnancy. [2] A. Martin. Die Krankheiten der Eileiter.

3. Ampullar Pregnancy. This is the common variety. The attachment of the ovum takes place in the ampullar or outer third of the tube. Tubo-ovarian pregnancy occurs when there is a prior adhesion of the ampulla to the ovary, so that both contribute to form the gestation-sac. This is a subdivision of ampullar pregnancy.

FIGURE 281.



Ampullar pregnancy. Right tube. Fœtus surrounded with coagulated blood. Longitudinal section.[1]

Development and Course of Tubal Gestation.

After the ovum has attached itself to the tubal wall it continues to develop. Naturally the conditions are not so favorable as in normal gestation: the tubal walls are less suited to its lodgement, and contribute less fully to its nourishment and development than does the uterus in normal pregnancy. Unless the ovum is inserted well in toward the uterus, as in interstitial pregnancy, the whole tube becomes extravascular, turgid, thinner, and, in most cases, less and less resistant. The margin of peritoneum around the ostium abdominale thickens and forms a ring about the fimbriæ. This ring by the eighth week usually closes over and shuts the tube. The development of the ovule in the tube, so far as the conditions will permit, continues to follow the same course as in the uterus.

As the fœtus enlarges the course of gestation will be modified in one of the following ways:

a. The fœtus, if in or near the ampulla, may be expelled from the tube through the ostium abdominale into the abdominal cavity. This is called tubal abortion.

b. The tube may rupture and partly or wholly discharge the fœtus in one of four directions:

1. Into the abdominal cavity.
2. Into the space between the broad ligaments.

[1] A. Martin. Die Krankheiten der Eileiter.

3. Into a space formed by adhesions between the tube and ovary.
4. Into the uterus.

a. **Tubal Abortion** necessarily occurs while the ostium abdominale is still open—that is, before the eighth week. The nearer the implantation of the ovule to the ostium the greater the liability to abortion. In this accident the product of conception—sometimes called tubal mole—is discharged with free hemorrhage through the still open ostium into the abdominal cavity. The hemorrhage gives rise to the formation of intraperitoneal pelvic hæmatocele. The accident may be fatal from shock and loss of blood, or the patient may recover. In some cases the mole lies quiescent in the tube, and if only partially detached it gives rise to repeated and dangerous hemorrhage. The false uterine decidua is usually thrown off with uterine hemorrhage when the tubal abortion takes place. The latter occurrence may be, as it were, masked by the uterine hemorrhage. Tubal abortion does not occur in interstitial and is rare in isthmic pregnancy; after occlusion of the ostium it can hardly occur even in the ampullar variety.

b. **Tubal Rupture.** Rupture of the tube may occur at any period. It is not very usual in the first month, is quite liable to occur in the second, and rapidly becomes less frequent after the beginning of the third, still less in the fourth. It may be due to direct tension on the tubal walls from the growing fœtus, but is commonly brought about by hemorrhage between the ovum and the sac. Among the other causes are mechanical violence from falling, jumping, digital examination, and coitus. The rupture usually takes place where the hemorrhage begins—that is, at the placental insertion. The fœtal membranes are not necessarily involved in the tear. If the ovum still retains its placental insertion, as it does in rare cases, it may continue to grow. More commonly it is extruded through the ruptured tubal wall and passes into the abdominal cavity; or it may pass downward between the folds of the broad ligament or into a cavity formed by adhesions between the tubal wall and the ovary.

Rupture in interstitial pregnancy may be either into the abdomen, where it is apt to be rapidly fatal from hemorrhage and shock, or into the uterine cavity, where the pregnancy may continue as in normal gestation. Rupture into the uterus may occur much later than the fourth month.

If the fœtus in ampullar or isthmic pregnancy is not entirely cut off by rupture from its nutritive connections, or disorganized by hemorrhage, and especially if the rupture is into the space between the folds of the broad ligaments or into a tubo-ovarian cavity, gestation may go to full term. If the fœtus and its investing membranes escape into the general peritoneal cavity, the placenta remaining in the tube, it is possible, though rare, for development to continue.

The old notion that a free embryo could escape and ingraft itself on the peritoneum is obsolete. The experiments of Leopold on dogs demonstrate the great absorbing power of the peritoneum, and indicate that no organism thus introduced could possibly survive.

In very rare instances the pedunculated isthmic pregnancy already mentioned may go to term in the unruptured tube.

PLATE XX.

Secondary Abdominal Pregnancy at Eight Months, Primarily Tubal. The primary attachment of the placenta is plainly discernible at the original tubal site. After rupture the placenta grew and became attached to a large surface on the anterior abdominal wall. The child was delivered through a retro-uterine vaginal incision.

If rupture occurs early in pregnancy, hemorrhage may be slight; but after the first month it is apt to be formidable and may cause death in a few hours. If the hemorrhage is slight, we have the common type of retro-uterine hæmatocele, which, if not aggravated by repeated bleedings, is generally encysted and gradually absorbed. In isthmic and ampullar gestation the rupture is often downward between the layers of the broad ligament. The blood is then poured out into this confined space. The natural tendency of this confinement is to check the hemorrhage. The blood thus accumulated is called a broad-ligament hæmatocele. The more gradual the rupture and the more slight the hemorrhage, the less will be the general and local disturbance. Under such conditions the embryo and its envelopes and placenta will have a better chance to adapt themselves to their enlarged and enlarging quarters, and may go on to term.

If the escaped embryo develops in a cavity formed by the two layers of the broad ligament and the outer wall of the tube, the pregnancy is called *tubo-ligamentous.* As the fœtus develops it presses aside and displaces other organs, the layers of the broad ligament become compressed or thickened and form adhesions to surrounding parts, the peritoneum is pressed upward and stripped from the bladder and abdominal wall, the uterus is displaced to the opposite side and, according to the direction of pressure, upward or downward.

If the placenta is situated in the upper part of the tube, so that it is pressed up above the fœtus toward the abdomen, forming a tubal placenta prævia, the danger from secondary rupture of the gestation-sac into the abdomen is very great; such an accident is apt to be fatal. If the placenta is situated below the fœtus toward the mesosalpinx, and pressed down upon the pelvic floor, this danger is less imminent; for rupture in this situation, since it does not of necessity directly involve the placenta, is attended with less hemorrhage and less risk.

All isthmic and ampullar pregnancies, if left to nature, end with death of the fœtus. The tubo-uterine variety of interstitial pregnancy may, as already explained, result in the passage of the embryo into the uterine cavity and subsequent normal gestation. Tubal pregnancy going on to term seldom results in the extraction of a viable child. The few children who survive the operation for their removal almost always die in early infancy.

Secondary Changes in Connection with Tubal Gestation.

If the death of the fœtus occur in the earlier weeks and the mother survive, the subsequent conditions will vary according as the embryo is retained in its envelopes or is cast out free in the abdominal cavity. In the latter case it may be quickly absorbed; in the former, absorption, although slower, is the usual ultimate result. Gestation that has advanced for several months may give rise to a variety of changes. The fœtus may undergo a process of mummification and remain encapsulated in the body of the mother for years. Chiari has reported a case in which the mummified fœtus was carried for fifty

...ndergo calcareous degeneration, so-called, and become ...nd remain in that state for years. The mummified or ... ordinarily gives little trouble; it may, however, be- ...f suppuration, and as a consequence the patient may ...xhaustion from peritonitis or blood-poisoning. On the ..., spontaneous opening of the abscess into the intestines or ... or through the abdominal walls, may lead to recovery. A ...sedion has been the mechanical cause of obstruction in labor. ... formation of a uterine decidua and its discharge in tubal pregnancy have been already mentioned. The musculature of the uterus also undergoes hypertrophy. The organ may enlarge to the size of the fourth month of pregnancy, and then to some extent diminish. If the tubal pregnancy is interrupted by abortion or rupture, the uterus generally at the same time throws off ...e decidua with a bloody discharge. This spurious labor may, hov ever, occur at any time, and always does occur at some time in the course of the gestation.[1]

Symptoms.

To some extent the symptoms of tubal pregnancy have already been indicated. In some cases the menstruation is uninterrupted. The usual signs of pregnancy, such as pigmentation, fulness of the breasts, and morning sickness, may be present or absent. Frankenthal[2] says that during the first eight weeks the ordinary subjective signs are absent. This statement is true for the majority of cases. Slight uterine hemorrhages may occur at irregular intervals from the beginning. Colicky pains, probably due to uterine contractions, appear toward the end of the second month, and are apt to continue at irregular intervals throughout the whole period of gestation. The signs of interstitial pregnancy are much like those of normal uterine gestation. This is explained by the nearness of the gestation-sac to the endometrium.

When tubal pregnancy goes on beyond the fourth month the external sign of asymmetrical enlargement in the abdomen begins to appear. The pressure symptoms are much like those of uterine pregnancy. In tubo-ligamentous pregnancy there is exaggerated pressure on the pelvic organs. Finally the usual signs of fœtal life are present, and in the latter months of tubal pregnancy painful fœtal movements are common.

The pains of spurious labor resemble those of normal parturition, and are sometimes very deceptive. They may be slight or severe. Cases are recorded in which they continued for days and even weeks, or recurred irregularly for long periods. One or two cases have been reported in which the sac ruptured into the vagina at the time of spurious labor and the child was produced by the natural passage. Rupture into the intestine and expulsion of the fœtus

[1] For a full description of the microscopical character of the fœtal envelope, the uterine decidua, and the minute changes in the gestation-sac, and for a more extended account of the degenerative changes that occur in connection with tubal gestation, the reader is referred to the most recent and complete works on this subject, those of August Martin, Webster, and J. Bland Sutton.

[2] Transactions Chicago Gynecological Society.

through the bowel have been reported. This could occur only in the earlier weeks.

Pelvic Hæmatocele.

Pelvic hæmatocele is an accumulation of blood in the pelvis consequent upon rupture of a bloodvessel; it may in rare instances be due to traumatism or to rupture of a vessel from disease of its walls; in the vast majority of cases it is the result of tubal abortion or tubal rupture, and is therefore an accident of tubal pregnancy; in fact, the symptoms of tubal abortion and rupture are those of pelvic hæmatocele. There are no premonitory signs. Small hemorrhages may give rise to no marked subjective symptoms; even large accumulations of blood, if free in the peritoneal cavity, may cause little or no pain. When the blood is poured out into confined spaces, such as the space between the folds of the broad ligaments, the subjective symptoms which are due to the tearing of the parts are distressing and overwhelming to the patient.

There is sudden and excruciating pain all over the abdomen, and especially about the pelvis; then come nausea, vomiting of bile, cold extremities, bathing of the skin in cold sweat, pinching of the features, rapid and weak pulse, tenesmus, and irritability. In serious cases the shock will be as great as in Asiatic cholera; the pain outbalances every other symptom. The tissues are being literally torn asunder. Such a scene can never be forgotten. The woman tosses to and fro and stains the bedclothing with vomit. The bloodless, pinched features, the bloodshot eyes starting from their sockets, the twitching of the facial muscles, the clinching of the fingers, the piercing shriek, the agonized bearing-down movement, as if the woman would drive the contents of her body from her, all combine to make upon the memory an indelible impression. These symptoms may subside and convalescence may be established, with absorption of the clot; or, on the other hand, fresh hemorrhage, with even more profound collapse, or death, may suddenly occur.[1]

The symptoms are much more pronounced in tubal rupture than in tubal abortion. If the abortion is complete—that is, if the ovum and its envelopes are completely thrown out—the hemorrhage may be comparatively slight and may be walled in by adhesions; under such circumstances slow recovery may take place. In this way many cases of pelvic hæmatocele recover without operation. Such results are probably more common in the very early stages of tubal gestation than is generally supposed. In fact, many such cases are unrecognized. There is, indeed, a possibility of moderate and gradual hemorrhage without any pronounced symptoms. In a very large proportion of cases, however, the abortion is incomplete, and a portion of the ovum or its envelopes is left attached. Repeated hemorrhages, with severe abdominal pain, may, after days or weeks of suffering, unless relieved by operation, end in collapse. If the progress of the case is more rapid, the symptoms closely resemble those of intestinal or gastric perforation and excessive hemorrhage combined. Hæmatocele may

[1] Adaptation from Emmet.

at first be unrecognized. If the bleeding be excessive, the early sense of fulness on percussion and palpation gives way later to the localized signs of a contracted clot.

As already stated, hemorrhage into the space between the folds of the broad ligament is confined, and therefore limited. If the force is sufficiently strong to cause secondary intraperitoneal rupture—that is, rupture from the interior of the ligament to the peritoneum—there will be great danger of profound acute anæmia and collapse. If the blood is confined, the vesical and rectal tenesmus and other symptoms due to tearing and pressure may be overwhelming.

Diagnosis.

In the early period of tubal pregnancy there are no certain means of diagnosis. The patient may have noticed no irregularity in her physiological life, and may have been utterly unaware of her condition until the occurrence of rupture or abortion. This is especially likely to be the case when the abortion or rupture occurs very early after impregnation. Usually, however, it occurs between the fourth and ninth weeks; during this time certain anomalies already mentioned, such as irregular menstruation or pain, may have attracted attention and led to the discovery of an enlarged tube. It is a significant fact in diagnosis that tubal pregnancy often occurs after long periods of sterility. Such sterility is therefore a suspicious circumstance. The microscopic finding of the cast-off decidua is, of course, strongly diagnostic. In the later periods of gestation many of the usual signs of pregnancy are modified and distorted by abnormal conditions.

The diagnosis may be considered with reference to three groups of cases:

I. Late cases in which neither tubal rupture nor abortion has

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EXPLANATION OF FIGURES 282 TO 288.[1]

Figure 282. Side view. Pregnancy complicated by hæmatocele of both broad ligaments; blood clot posterior and to either side of the uterus, crowding the cervix forward.

Figure 283. Retro-uterine hæmatocele extending into both broad ligaments, the mass on the one side rising much higher than on the other, so that accumulation of blood feels to the touch like two distinct masses closely set together and sharply rounded above and at the sides.

Figure 284. Front view. Hæmatocele of left broad ligament extending anterior to the uterus; felt as a hard tumor in the left vaginal vault close to the uterus; easily felt through the vagina and in the left inguinal region.

Figure 285. Retro-uterine hæmatocele lifting the peritoneum high out of the cul-de-sac of Douglas, and extending into both broad ligaments. Easily felt on vaginal and abdominal palpation.

Figure 286. Front view. Hæmatocele in both broad ligaments extending in front of the uterus; tumor larger on the right side than on the left, and divided on the left into two segments. The mass on the left side communicates with that on the right, high up in front of the cervix. Uterus pushed back to the posterior wall of the pelvis.

Figure 287. Side view. Retro-uterine hæmatocele, not extending to the sides of the pelvis. Mass felt between the uterus and rectum, lifting the peritoneum out of the cul-de-sac of Douglas and crowding the uterus forward.

Figure 288. Front view. Hæmatocele of the left broad ligament, lying close to the uterus; easily felt through by vaginal touch and by palpation over the left iliac region. Crowds the uterus forward and to the right.

[1] Suggested by Kuhn, in Veit, Handbuch der Gynäkologie.

Figure 282.

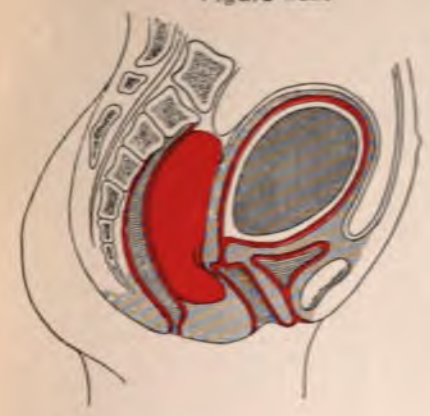


Figure 285.

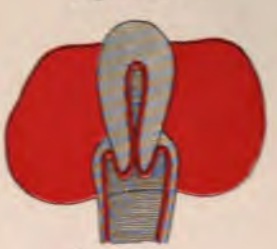


Figure 286.

Figure 283.

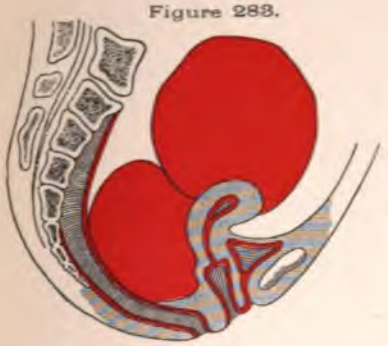


Figure 287.

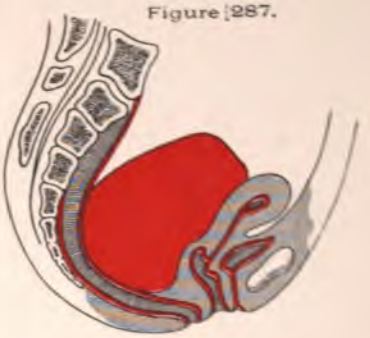


Figure 284.

Figure 288.

occurred and in which gestation is progressing or has progressed to term.

II. Early cases in which neither tubal rupture nor abortion has occurred.

III. Early cases in which tubal rupture or abortion has occurred.

I. Late cases in which neither tubal rupture nor abortion has occurred, and in which gestation is progressing or has progressed to term, may be recognized by the following characteristics:

1. Uterus enlarged to the size of two months' pregnancy.
2. Formation of a tumor at one side of the uterus, which, like the uterus in normal gestation, gradually increases in size, although the size of the mass does not always correspond strictly to that of normal gestation.
3. As gestation progresses the fœtus may be palpated externally. Palpation may disclose occasional contractions in the gestation sac; the fœtal heart-tones become distinct at about the same time as in normal pregnancy.
4. Intermittent false labor at nine or ten months, followed by cessation of circulation in the placenta and death of the child, and finally by marked diminution in the size of the tumor.
5. General sepsis from absorption of decomposing products of gestation in most cases.

II. Early cases in which neither tubal rupture nor abortion has occurred may be diagnosed by the following signs:

1. Cessation of menstruation for one or two months, and other signs of pregnancy, such as nausea, mammary changes, and venosity of the vulva and vagina.
2. Ovoid mass, corresponding in position to the right or the left tube—not very sensitive to pressure.
3. Intermittent contractions of the mass—not always felt.
4. Scrapings from the uterus on microscopic examination show decidua—a questionable procedure likely to cause tubal rupture or abortion.
5. Death of the fœtus in some cases without tubal rupture or abortion may be followed by absorption of the amniotic fluid, with rapid decrease in the size of the tumor.

III. Early cases in which rupture or abortion has occurred are characterized by symptoms same as those of Group II., followed by sudden onset of extreme pelvic pain, evidences of acute, alarming, and, sometimes, fatal hemorrhages and sudden appearance of a pelvic tumor—hæmatocele.

Differential Diagnosis.

The following outlines will enable the reader to distinguish tubal pregnancy from numerous conditions with which it is sometimes confounded:

REGNANCY. HÆMATOCELE.
ry of infection.
of pulse.
first subnormal, later may

ing, but subsides after few

of hemorrhage:
den, acute anæmia.
b. Weak, rapid heart.
c. Dyspnœa.
d. Sighing respiration.
e. May be syncope.

RUPTURED TUBAL PREGNANCY. HÆMATOCELE.
1. History of pregnancy.
2. Sudden onset.
3. Hemorrhage may cause collapse.
4. Temperature normal or subnormal at first.
5. Usually mass soft—later hard.
6. Fever may finally follow appearance of mass.
7. Uterine decidua.

RUPTURED TUBAL PREGNANCY. HÆMATOCELE.
1. Urgent symptoms at onset.
2. Development rapid.
3. Not very sharply circumscribed.
4. Immobility of mass.
5. Signs of pregnancy precede formation of mass.
6. Uterine decidua.

RUPTURED TUBAL PREGNANCY. HÆMATOCELE.
1. No pre-existing tumor.
2. History of pregnancy.
3. Tumor not smooth and tense.
4. Uterus somewhat enlarged.
5. Uterine decidua.

TUBAL PREGNANCY.
1. Before rupture, gestation sac harder.
2. Fluctuation and ballottement absent.
3. Uterus slightly enlarged. Tumor separate from uterus and crowds it to opposite side of pelvis.
4. Unusual history.
5. Tubal abortion, or rupture between fourth and ninth week usual.
6. Discharge of uterine decidua with false labor pains at time of tubal abortion.

RUPTURED PYOSALPINX.
1. Initial history of infection.
2. Pulse not so rapid.
3. Rise of temperature marked from onset.
4. Pain less intense but continuous.
5. Usually absent.

PELVIC PERITONITIS AND CELLULITIS.
1. History of infection.
2. Onset less sudden.
3. No hemorrhage.
4. Temperature elevated.
5. Usually mass hard—later may soften.
6. Recedes.
7. Absent.

UTERINE AND OVARIAN TUMORS.
1. Absent.
2. Slow.
3. Mass sharply circumscribed.
4. Mobility usual.
5. Absent unless complicated by pregnancy.
6. Absent.

HEMORRHAGE INTO OVARIAN CYST.
1. Pre-existing tumor.
2. Absent.
3. Tumor smooth and tense.
4. Not usually enlarged.
5. Absent.

NORMAL PREGNANCY.
1. Uterus softer.
2. Fluctuation and ballottement later.
3. Tumor is enlarged uterus.
4. Nothing unusual in history.
5. Does not occur.
6. Does not occur.

Uterine displacements, pregnancy in one horn of a bicornate uterus, perforation of the stomach or bowel, and rupture of an aneurism have been mistaken for tubal pregnancy, but none of these conditions produces the symptom group outlined in the above paragraph on Diagnosis.

Prognosis.

This is always doubtful and serious. Spontaneous recovery is, however, not uncommon. In former times pelvic hæmatocele was not, in the majority of cases, recognized as related to tubal pregnancy, and was therefore usually treated on the expectant plan. Under such conditions spontaneous cures were frequent. Our knowledge of the true pathology and the consequent greater frequency of operative inter-

ference does not change the fact that spontaneous recovery will often occur just the same, even though the name of the condition has been changed from hæmatocele to tubal pregnancy. However, recovery occurs much more frequently with than without operation. In two hundred and seventy-eight cases for which there had been no operation, collected by Schauta, Martin, and Orthmann, one hundred and eighty-seven, or a little over two-thirds, died; while five hundred and seven, or 80 per cent., of six hundred and thirty-six cases operated upon, survived.[1]

Treatment.

From the observations already made, it follows that the treatment of tubal pregnancy will, as a general rule, be operative. The safety of the patient is immeasurably greater if the diagnosis is made and the operation performed in the earlier weeks, before the time of tubal abortion or rupture. Unfortunately for the great majority of cases, the first intimation of the diagnosis comes with one or the other of these accidents.

The treatment will vary with the varying conditions. The four possibilities are:

1. That the diagnosis has been made before the time of rupture or abortion.
2. That rupture or abortion has just occurred.
3. That the patient has survived the immediate effects of rupture or abortion, and gestation has ceased with the death of the fœtus.
4. That rupture has occurred, but the fœtus is alive and gestation is still going on.

1. *Treatment before Rupture or Abortion.* The tube and its contents should be immediately removed. Only by this means can the woman be protected against the extreme peril of continued tubal gestation. The danger of the operation is not greater than the removal of the uterine appendages under other circumstances, and the technique is the same. In very many cases tubal pregnancy is unrecognized until the abdomen has been opened on the diagnosis of a supposed hydrosalpinx or pyosalpinx. This fact, as Penrose says, emphasizes the value of the rule to operate for all gross lesions of the tube.

2. *Treatment Immediately after Rupture or Abortion.* The general rule is to operate without delay. It may be unwise to wait for reaction from the shock and hemorrhage, for hemorrhage is the very indication for interference. Indeed, the immediate object of the operation is to stop the hemorrhage.

The writer has recorded two cases in which the patients were in apparent collapse, and for this reason it was not deemed wise to operate unless there should be a tendency to rally. In both cases there were slow improvement and final recovery without operation. A few months later in both cases the products of conception had entirely disappeared by absorption. These cases show that without operation the prognosis, even in the most extreme conditions, is not hopeless. The operation is as follows:

[1] A. Martin. Die Krankheiten der Eileiter, 1895.

The abdomen is opened as for the removal of the uterine appendages. The tube and, together with it, the broad ligament, are grasped and pulled into the wound; two pairs of strong hæmostatic forceps are placed on the broad ligament—one on the infundibulopelvic extension of it, near the pelvic wall, the other close to the uterus; this will control the ovarian artery at its point of entrance both to the ligament and to the uterus. Ligatures are immediately substituted for the forceps, the tube removed, and hæmostasis secured as described in Chapter XXIII. If there is a cavity between the folds of the broad ligament, it may be obliterated by fine buried catgut sutures.

The free infusion of normal salt solution, two or more pints, by hypodermoclysis, preferably under the breast, is strongly indicated. This infusion, which may be given, according to the indication, before, during, and after the operation, has turned the scale for recovery in many a desperate case. If the hemorrhage has been great, Frankenthal advises direct transfusion of blood.

3. *If rupture or abortion has occurred*, and the patient has recovered from its immediate effects, and gestation has ceased with the death of the fœtus, there may be spontaneous cure, with absorption and disappearance of the products of conception. Under these favorable conditions, especially if there be continuous gradual improvement in the symptoms, one may adopt the plan of watchful expectancy. Frankenthal says: "Treat conservatively only those cases seen some time after primary rupture, when you are reasonably certain of the death of the fœtus, when the alarming symptoms have subsided, and when, presumably, absorption is going on." Intraligamentous rupture occurring within the first three or four weeks of gestation is rather liable to be followed by recovery and absorption. One must, however, be prepared to operate promptly upon the least evidence of secondary rupture and hemorrhage or upon the onset of infection. Even in uncomplicated cases of this third division, however, it is permissible and possibly safer to operate, and thereby relieve the woman of the danger incident to the presence of a dead fœtus in the pelvis.

Previous to the fourth or fifth month the entire gestation-sac and its contents may usually be removed without great danger of fatal hemorrhage. At least the hemorrhage, if troublesome, may be controlled by ligature of the ovarian vessels, or, if necessary, of the ovarian and uterine vessels. After the fœtus has been dead for some time there is little or no danger of hemorrhage in separating the placenta.

4. *If gestation has advanced beyond the fourth or fifth month*, and the child is living, the removal of the fœtus, together with the placenta and gestation-sac, is practicable in only a small minority of cases, and then only in the hands of the experienced and expert operator. The conditions favorable for this radical operation are found in the rare pedunculated tubal pregnancies already mentioned, in which gestation may go to term without rupture, and in other rare cases in which the sac can be isolated, brought through the wound, and a pedicle formed, or its attachments separated without excessive hemorrhage. Ligature of the ovarian and uterine vessels does not control the terrible hemor-

rhage which at this period and under ordinary conditions invariably follows separation of the placenta. The surgeon must assume the great responsibility of a decision, when the abdomen is open, whether or not he will attempt the removal of the gestation-sac. The deliberate attempt to remove it has many times resulted in uncontrollable and fatal hemorrhage. In opening the sac the operator may accidentally incise or partially separate the placenta and find himself face to face with a most formidable, if not unmanageable, hemorrhage. Compression of the aorta and ligature of the uterine and ovarian arteries, if promptly and skilfully executed, may or may not save the patient's life. In the vast majority of cases in which gestation is in progress beyond the fourth or fifth month the operator must be content to incise the sac, remove the fœtus, stitch the sac to the abdominal wound, and leave the placenta. J. Bland Sutton proposes, instead of stitching the sac to the wound, to close it with sutures. This is done in the hope that the placenta will undergo atrophy or absorption. The danger of infection in a sac thus closed would be considerable. The more usual and safer plan, therefore, is to leave the placenta and establish gauze or tubular drainage. After two or three weeks, when the placental circulation has ceased, the wound may be reopened, the gauze removed, and the placenta taken away. Another more common and approved practice is to let the placenta disintegrate and drain away as débris.

Some operators prefer to delay operation until after term, when the child has died and the placental circulation has ceased. The products of conception may then be removed entire, with the minimum danger of hemorrhage. This plan necessarily involves the dangers incident to the continued presence of an extra-uterine fœtus.

The Abdominal Versus the Vaginal Route. If the products of conception are low down and quite accessible, if gestation has not passed beyond the eighth week,[1] and if the tube is movable so that it can readily be brought out through the vaginal wound, it is permissible to operate by that route. If the gestation sac is between the folds of the broad ligament and the child has been for some time dead, and the placental circulation has therefore ceased, one may remove the products of conception, unless too large, through the vagina. In all other cases the difficulty of controlling hemorrhage through the vagina is too great, and the abdominal route is therefore to be preferred. The difficulty of ligaturing the infundibulo-pelvic ligament through the vagina is an objection to that route.

In all cases of ectopic pregnancy at term the viability of the child as compared to the life and welfare of the mother is a very secondary matter. Few children are produced alive, and fewer still survive many days. The few who do survive are physically and mentally inferior. Harris[2] collected a number of cases of living children of extra-uterine pregnancies, and in 1895 reported to Orthmann that of fifty-seven whose histories he had been able to trace only five survived their second year.

[1] Frankenthal Transactions Chicago Gynecological Society, 1896.
[2] American Journal of the Medical Sciences, August-September, 1888.

CHAPTER XXXVII.

CONGENITAL MALFORMATIONS.

MALFORMATIONS may be due to arrested development or to excessive development. In the first class of anomalies we have the malformations due to the persistence of embryonal conditions; the second class includes the hypertrophies and multiplications of otherwise normal organs and tissues.

The genital organs in the fœtus appear in a structure called the genital eminence, which first lies on each side of the median line and subdivides later, the inner portion forming the sexual gland—the testicle in the male and the ovary in the female—while the outer section becomes the Wolffian ducts and bodies and the canals of Müller. In the female embryo at term the Wolffian bodies, which had served the function of the kidney during embryonal life, atrophy and become the body of Rosenmüller, while the ducts of Müller in their upper portion form the tubes, and in their lower portion coalesce with the Wolffian ducts to produce the uterus and vagina. It is essential to keep these facts in mind in considering the genital malformations due to arrest or excess of development.

Malformations of the Ovaries.

Malformations of the ovaries are not numerous. They consist mainly in lack of development or in excessive development. The principal anomalies are these:

Accessory or constricted ovaries.
Supernumerary ovaries.
Absence of the ovaries.
Rudimentary ovaries.
Congenital hypertrophy of the ovaries.
Congenital displacement of the ovaries.

Accessory Ovaries are found in from 2 to 3 per cent. of autopsies. They are always of small size, and are generally connected with the normal ovaries by a pedunculated or sessile attachment. Two or three may be found in one case. They are usually parts of the original ovary separated during late fœtal life by the constriction of peritonitic bands. The ovary may be thus divided into equal halves or may be only partially divided. The presence of accessory ovaries may account for pregnancy after both ovaries are supposed to have been removed.

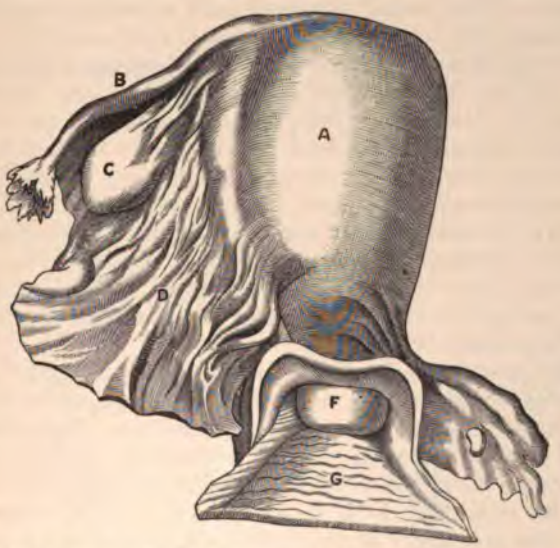
Supernumerary Ovaries. Only one authentic case has been reported.[1] This was a third ovary situated in front of the uterus

[1] Winckel, in Allbutt and Playfair, System of Gynecology.

in direct relation with the bladder, and connected to the uterus by a strong ovarian ligament. This ovary was twice the normal size. The two other ovaries were normal and of equal size. There was no trace of peritonitis in the neighborhood.

Absence of the Ovaries is a rare condition. It is usually associated with imperfect development or absence of one or more of the other sexual organs. An absolute diagnosis can be made only by autopsy, for the ovary may be present in an abnormal location or in a partially developed state, and may therefore be overlooked. Absence of one ovary is apt to be associated with absence of the corresponding half of the uterus and Fallopian tube. The writer has, however, in one case operated for the removal of the suppurating right tube and ovary, and found a perfectly developed uterus and, so far as could be discovered, entire absence of the left tube and ovary. There was only a slight protuberance at the left uterine cornu to mark the point where the tube should have joined the uterus. Figure 289.

FIGURE 289.



Absence of the left ovary, with full development of the other genital organs. This would be a good illustration of the author's case. A. Corpus uteri. B. Fallopian tube. C. Ovary. D. Broad ligament. F. Cervix uteri. G. Vagina.[1]

Rudimentary Ovaries are not very uncommon. They are of small size, and the Graafian follicles are absent or rudimentary. The uterus may be normal or may be also rudimentary.

Congenital Hypertrophy of the Ovaries. Excessive growth of the ovary has been recorded, but this cannot be strictly classed as malformation. It has been attributed to hyperæmic or inflammatory conditions during fœtal life.

Congenital Displacement of the Ovary. "Non-descent of an

[1] A. Martin. Die Krankheiten der Eileiter.

ovary is a rare but not unknown anomaly. Bland Sutton has reported a case in which the right ovary was adherent to the lower border of the kidney of the same side, and I have seen a case in the newborn infant in which it was attached by peritonitic bands to the cæcum. It has been stated that it may be found free in the peritoneal cavity." At least occurrences of this kind have been recorded. Sir Astley Cooper, for example, once transplanted the testicle of a cock to the abdominal cavity of a hen, where it continued to grow.

"Instead of non-descent, there may be dislocation of the ovaries downward into the inguinal canal. According to Puech, congenital inguinal hernia of the ovary is much more common than acquired, and Zinnis has recently reported an instance of it; but Bland Sutton states that he knows of no case in which the ovarian nature of the herniated body has been proved by microscopical examination conducted by a competent observer. Herniation of the ovary, which may be unilateral or bilateral, is usually associated with displacement of the Fallopian tube, and sometimes with malformation of the uterus and malposition of the kidney. It may be due to defective development of the round ligament and a patent condition of the canal of Nuck."[1]

Clinical Significance of Ovarian Malformation. The absence of one ovary, if the other is perfectly developed, does not render the woman sterile. On the contrary, her reproductive functions may be in no respect impaired. If both ovaries are rudimentary or absent, sterility is the rule. There is usually wanting in such cases the normal development at puberty; there will also be an associated faulty general nutrition, a weak nervous organization, chlorosis, and not uncommonly a growth of hair on the face, especially the upper lip. The individual may retain even the general physical characteristics of infancy and childhood, or there may be an apparently full development of the extra-pelvic organs.

The diagnosis of ovarian malformations is made by the above signs and symptoms and by the recognition on conjoined examination of undeveloped, absent, accessory, or otherwise anomalous ovaries. Early and accurate diagnosis is important, for only by this means will the woman be saved from a possible long-continued and useless treatment for sterility. It is often impossible to say that an apparently rudimentary ovary is congenital, for it may have been subject to atrophic changes consequent upon the acute infectious diseases of childhood.

Malformations of the Fallopian Tubes.

These malformations are analogous to those of the ovary, and are therefore as follows:

Supernumerary tubes.
Accessory tubes and ostia.
Increased length and excessive convolution.
Rudimentary development.
Absence of the tubes.

[1] Quoted from Allbutt and Playfair, System of Gynecology.

Supernumerary Tubes are rare; they may be associated with supernumerary ovaries. Only a few cases have been recorded.

Accessory Tubes and Ostia are not uncommon. As many as six

FIGURE 290.

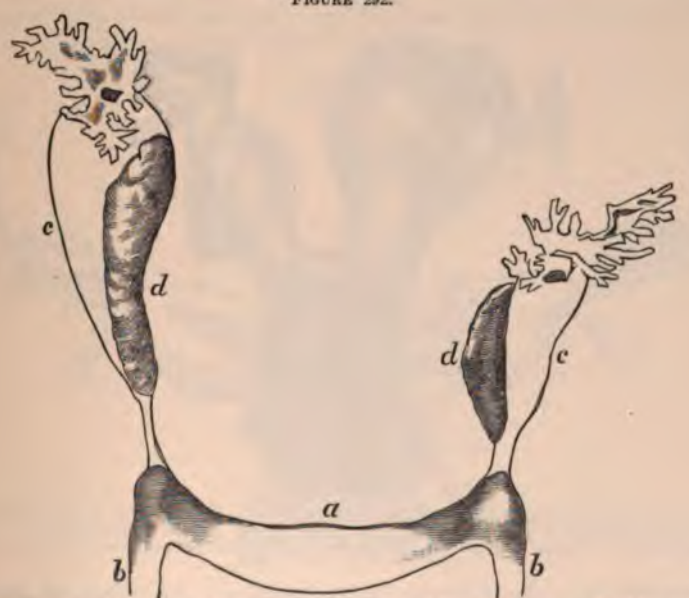
Tube with accessory ostium. CA. Accessory ostium. P. Small intraligamentous cyst.[1]

FIGURE 291.

Tube with accessory tube and ostium.[2]

accessory ostia have been observed in one tube. The anomaly has no definitely recognized significance.

FIGURE 292.



a. Ribbon-shaped rudiment of the uterus. *b, b*. Round ligaments. *c, c*. Fallopian tubes. *d, d*. Ovaries.[3]

Increased Length and Excessive Convolution of the tubes have been said to favor tubal pregnancy; the cause is unknown.

[1] After Kossman, in A Martin. Die Krankheiten der Eileiter. [2] Ibid.
[3] From Kussmaul and Nega. Mann's American System of Gynecology.

Rudimentary Development. The rudimentary tube is usually imperforate, being a mere fibrous cord with, perhaps, the semblance of an open ampulla and fimbriæ. The corresponding ovary may or may not be also rudimentary or absent. The accident is due to failure of development of Müller's duct.

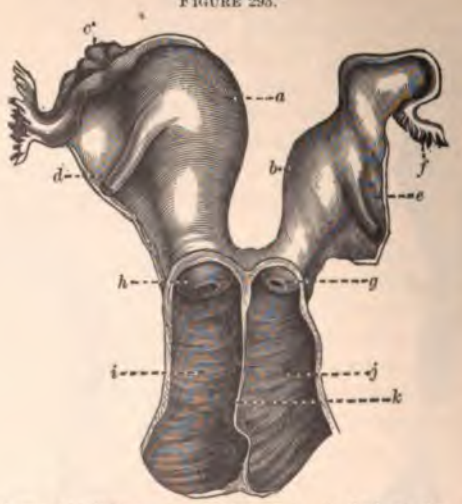
Absence of the Tube more frequently pertains to one than to both sides. When both tubes are absent the uterus and ovaries are also usually wanting. Cases have been recorded in which the tube and kidney on the same side were absent. Absence of one tube is usually associated with want of development of the corresponding side of the uterus—that is, with *uterus unicornis*.

The Clinical Significance of malformations of the tubes is much the same as that already outlined for malformations of the ovaries.

Malformations of the Uterus.

The developmental defects of the uterus form a large proportion of the genital malformations. They have been elaborately studied and classified, but for the most part may be ranged under two general heads: 1. Those due to imperfect development of Müller's ducts. 2. Those due to imperfect blending of the same.

FIGURE 293.



Double uterus, uterus didelphys. *a*. Right cavity. *b*. Left cavity. *c*. Right ovary. *d*. Right round ligament. *e*. Left round ligament. *f*. Left tube. *g*. Left vaginal portion. *h*. Right vaginal portion. *i*. Right vagina. *j*. Left vagina. *k*. Partition between the two vaginæ.[1]

Infantile Uterus. If the Müllerian ducts unite but do not continue to develop, the result will be an undeveloped, infantile, or fœtal uterus. If the arrest of development occurs very early in fœtal life, the uterus will be extremely rudimentary. It may consist of an infantile cervix, and in place of the corpus only a fibrous cord extending from the site of one Fallopian opening to the other. If arrest

[1] From De Sinéty and Ollivier, in American System of Gynecology.

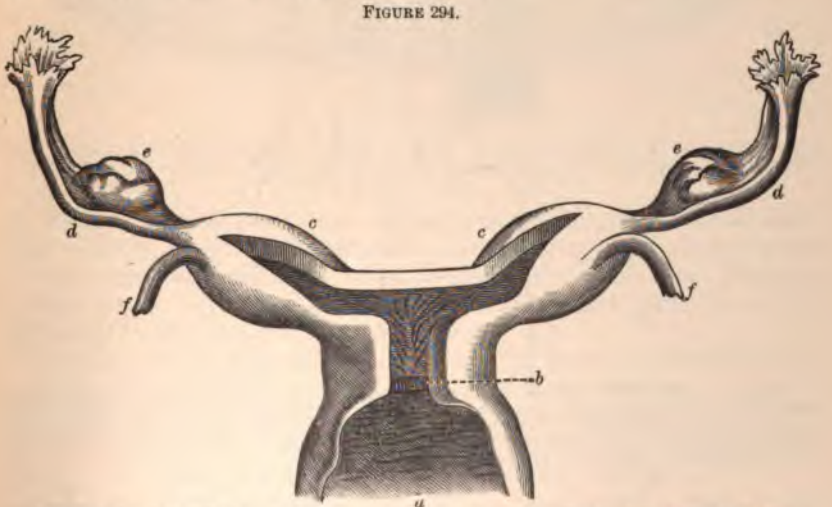
of development does not occur until after birth, the uterus will be smaller than normal, but in other respects not strikingly different from the fully developed organ.

The anomalies due to defective blending of Müller's ducts are numerous and frequent. Nearly every degree of imperfect fusion has been observed. The following anomalies are due to this cause.

Double Uterus. The most extreme anomaly due to defective blending is the double uterus (uterus didelphys), in which there are two complete organs lying side by side, each Müllerian duct having formed a perfect uterus with cervix and fundus, but with only one cornu, one Fallopian tube, and one round ligament. Either of these uteri may be functionally competent. Pregnancy and parturition may therefore proceed normally. On the other hand, one may be rudimentary or imperforate. If the imperforate organ is functionally active, it may become distended with menstrual blood and form hæmatometra. This will require surgical interference.

Accessory Uterus. A very curious and rare malformation is the uterus accessorius. In this condition, besides the normal uterus, there exists another uterus anteriorly, between it and the bladder. In one case a third uterine lobe was found attached to the single cervix of a bifid uterus. It is hard to account for these anomalies. The assumption has been made that the accessory organ was developed from a diverticulum of a Müller's duct.

FIGURE 294.



Uterus bicornis unicollis. *a*. Vagina, laid open. *b*. Single cervix. *c, c*. Uterine horns. *f, f*. Round ligaments. *d, d*. Fallopian tubes. *e, e*. Ovaries.[1]

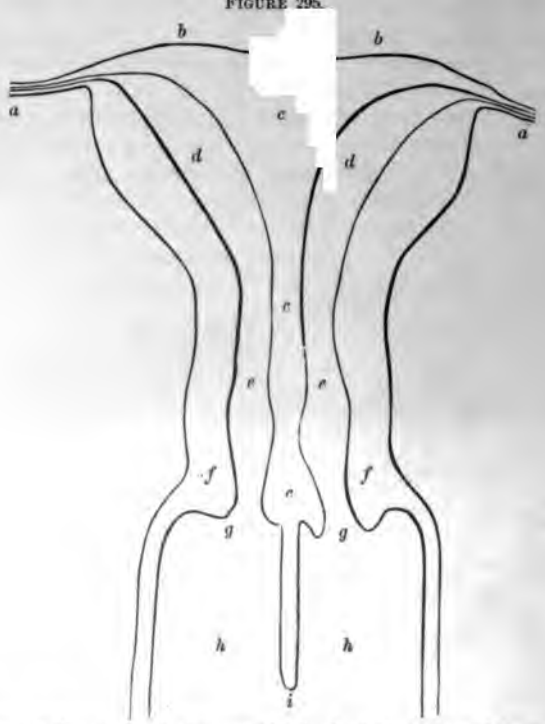
Bicornate Uterus. Next in importance to the double uterus is the much more frequent bicornate uterus, in which fusion of Müller's ducts has occurred lower down than normal, with the result of producing a Y-shaped organ. This deformity occurs in all

[1] Kussmaul, in Mann's American System of Gynecology.

ne extreme, the septum extends the whole length of the es rise to a double os externum; in the other extreme ıa may be separated only by a notch at the fundus rmis).

otus. In this anomaly there is complete division of the o cavities by an antero-posterior vertical partition or ... Uterus subseptus signifies an imperfect septum and conse- ... partial division. This is not indicated by the external appearance of the organ. The septum may be complete or incomplete, or it may form only a ridge on the interior of the uterus. It may even extend through the cervix, or it may be confined to the cervix or to

FIGURE 295.



Uterus septus duplex (natural size), completely double uterus and incompletely double vagina of a girl twenty-two years of age. *a, a.* Tubes. *b, b.* Fundus of the double uterus. *c, c, c.* Partition of uterus. *d, d.* Cavities of the uterine bodies. *e, e.* Internal orifices. *f, f.* External walls of the two necks. *g, g.* External orifices. *h, h.* Vaginal canals. *i.* Partition which divided the upper third of the vagina into two halves.[1]

the corpus. There may be, in fact, every possible variety in the situation or completeness of the septum. The typical, if not the commonest, form has two lateral cavities involving both body and cervix. The bicornate and septate uteri have a similar clinical significance. In either there is liable to be an imperforate condition of one side of the septum or the other, with resulting hæmatometra. Pregnancy occurring in one of the horns of a bicornate uterus, especially if a

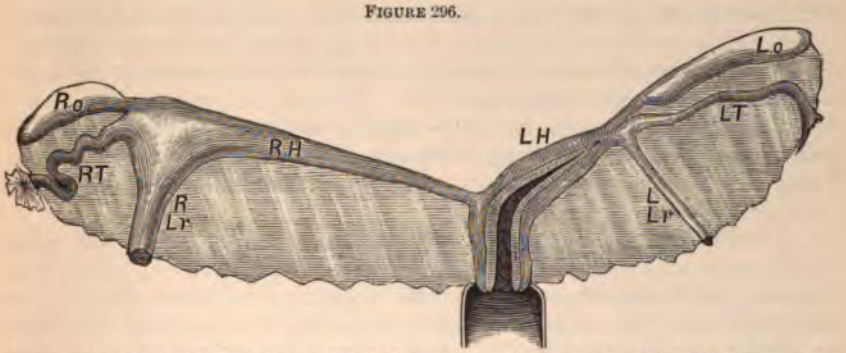
[1] Kussmaul, in Mann's American System of Gynecology.

septum also exists, may give rise to the difficulties and dangers of a tubal gestation. Menstruation is liable to be frequent and otherwise abnormal, and parturition to be embarrassed. In a subseptate uterus malpresentations are prone to occur and the insertion of the placenta to be abnormal.

There is in the above varieties a complete gradation between the double uterus on the one hand, and the uterus septus on the other. The relative dimensions of the two horns may vary to the extent of complete absence of one, and consequent uterus unicornis.

Uterus Unicornis. When only one horn of the uterus is well developed, or only one exists, we have the single-horned uterus, or uterus unicornis. There are here failure of fusion and more or less atrophy of the duct on one side. The kidney, ureter, ligaments, tube, and ovary on the side of the lacking or imperfect cornu are also, as a rule, rudimentary or absent. The rudimentary horn may be hollow or solid; if the former, its cavity may or may not connect with that

FIGURE 296.



Uterus unicornis. *LH.* Left horn. *LT.* Left tube. *L.o.* Left ovary. *RH.* Right horn. *RT.* Right tube. *R.o.* Right ovary. *RLr.* Right round ligament. *LLr.* Left round ligament.[1]

of the developed horn. If menstruation takes place in the closed horn, there will be hæmatometra, and the normal progress of menstruation on the other side will lead to confusion in the diagnosis. Bilateral hæmatometra, both horns being imperforate, would give rise to less difficulty in the diagnosis.

Among the less important anomalies of the uterus are the following:

Defect or absence of the vaginal portion of the cervix.

Septate os externum, with no trace of septum above.

Normal development on one side and defective development on the other; this would be an approach to a unicornate uterus.

Flat or arched fundus.

Congenital prolapse, retroversion, retroflexion, or anteflexion.

Congenital communication between the endometrium and intestines or bladder.

In a remarkable case one side of the bipartite uterus is said to have developed on the exterior of the body.

Premature Development of the Uterus. This is usually asso-

[1] From Schröder. American System of Gynecology.

ciated with similar precocity in the other genital organs. Young girls may thus menstruate at a very early age and show the sexual development of mature years.

Malformations of the Vagina.

The vagina, in common with the uterus, is formed by the coalescence of Müller's ducts, and therefore shares largely in the malformations of that organ. Thus the double uterus and the uterus septus are commonly associated with double vagina.

The congenital anomalies of the vagina are these:

Vagina septa.
Absence of the vagina.
Atresia of the vagina.

Vagina Septa. A completely double vagina having two canals, each opening into an external vulva of its own, is very rare, only one case, that of Katharin Kaufmann, having been reported. In this case[1] the pelvis was divided by a peritoneal fold into two lateral cavities; each half contained a bladder, a unicornate uterus, an ovary, a Fallopian tube, and a rectum. The spinal cord was bifurcated at the level of the third lumbar vertebra.

The ordinary and much more common double or septate vagina is divided into two passages by a septum above the vulva. The hymen may have one or two openings, and the septum, as in the uterus, may be complete or partial.

Double uterus and double vagina often coexist. In some cases the vagina is double and the uterus single, with the os externum then opening into one side of the double vagina. The other side ends in a cul-de-sac. If, under these conditions, the blind passage be alone used for coition, sterility will result. In other cases both sides may be in communication with the uterus. The septum may be so imperfect as to constitute only a ridge along the posterior and anterior walls of the vagina.

The septum seldom divides the passage into exactly equal halves. Coitus is usually confined to one side. In case of uterus unicornis the vagina may be very small—in fact, of only half size. This is because one of Müller's ducts has failed in development from the uterus down, and the other has developed only on its own side, producing a unilateral vagina. In case of double uterus, or uterus septus, or uterus bicornis, one-half of the vagina may be imperforate, with resulting accumulation of menstrual blood in the uterus and vagina on that side. This is hæmatometra and hæmatocolpos.

Aside from the possibilities of sterility and hæmatocolpos, and from the uterine conditions which may be associated, a vaginal septum is not of itself a very serious matter. It may never be suspected until parturition, and even then the septum may be destroyed or pushed to one side by the passing child.

Complete Absence of the Vagina is usually associated with absence or defect of the ovaries, tubes, and uterus, and with a generally

[1] Reported by Suppinger. Allbutt and Playfair, System of Gynecology.

defective sexual organization. If, however, the defect is only in that part of Müller's ducts which forms the vagina, the uterus and tubes may be normally developed. Absence of the vagina will then lead after puberty to retention of the menstrual products and the necessity of making an artificial vaginal passage. This is indicated in order to give exit to retained menstrual fluid, and is permissible to establish the physiological integrity of the vagina. Impregnation and parturition have taken place through a vagina thus opened. This subject will be further considered in the next chapter.

Inflammatory Atresia of the Vagina must not be confounded with congenital absence of the organ. The former is the result of adhesive inflammations which may be fœtal and involve the whole length of the passage, or it may be due to inflammation occurring in childhood or in adult life; see Dissecting Vulvo-vaginitis. In a case of adherent vaginal walls, the walls when separated will, wherever the inflammation has not been destructive, be lined with vaginal mucosa. In congenital absence of the vagina the mucosa has never developed. There is only connective tissue between the vesical and rectal walls.

The remaining vaginal anomalies are rare: they include diverticula and communications between the vagina and other organs, such as the rectum and urethra. These openings are dependent not upon defects of Müller's ducts, but rather upon fœtal cloacal conditions, hereafter to be described.

Malformations of the Hymen.

The hymen is an organ of variable strength and form. It may be annular, notched, fimbriated, fenestrated, cribriform, crescentic, thick, thin, fragile, tough, or vascular. Some of these conditions are normal, others but slightly abnormal. Complete absence is extremely rare, if not unknown. Imperforation, so-called, is a condition usually due to closure of the end of a Müllerian duct, and is therefore in no sense an abnormal hymen.

The importance of these anomalous conditions varies. A rigid hymen makes coitus painful or impossible, a very vascular membrane may lead to a temporary profuse hemorrhage, and imperfection gives rise to hæmatocolpos, or in extreme cases also to hæmatometra, and demands operative interference; see Congenital Atresia of the Genital Tract. A rigid hymen may, after marriage, require divulsion or incision.

Malformations of the Vulva and Anus.

This subject becomes relatively simple when we understand the embryological development of the vulva and anus. At the end of the sixth week of fœtal life the tangible differentiation of sex begins, and the developmental changes which then normally take place are shown in Figures 297 to 301:[1]

At first the allantois (which forms the bladder), the rectum, and the

[1] After Schröder. From Hart and Barbour, Manual of Gynecology.

Müllerian ducts (which form the vagina, uterus, and Fallopian tubes), all communicate with a common cavity, but do not at this time open

FIGURE 297.

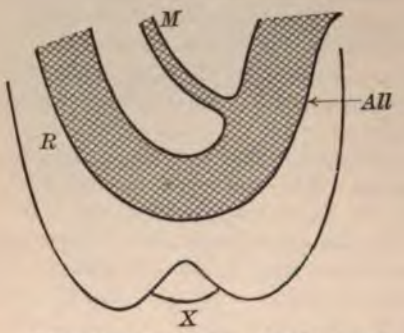


FIGURE 298.

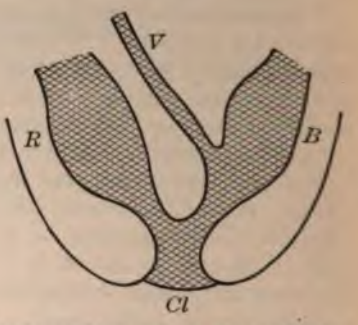


Figure 297.—*R*, rectum, continuous with, *All*, allantois (bladder), and, *M*, duct of Müller (vagina). *X*. Depression of skin below genital prominence, which grows inward and forms vulva.

Figure 298.—The depression has extended inward and, becoming continuous with the rectum and allantois, forms the cloaca. *Cl*. Cloaca. *B*. Bladder. *V*. Vagina.

FIGURE 299.

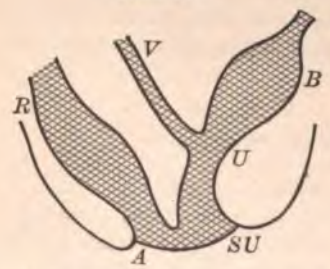
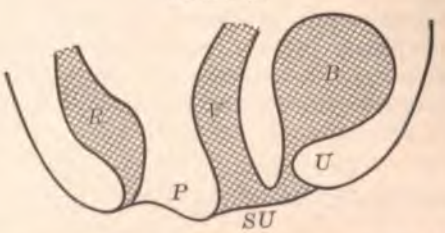


FIGURE 300.

Figure 299.—The cloaca is becoming divided into the uro-genital sinus, *SU*, and anus, *A*, by the downward growth of the perineal septum. See also Figure 300.

Figure 300.—The perineum is completely formed. *P*. Perineum. The ducts of Müller have united and formed the vagina, *V*.

FIGURE 301.



The upper part of the uro-genital sinus has contracted into the urethra; the lower portion, *SU*, now becomes the vulva. *P*. Perineum. *R*. Rectum. *V*. Vagina. *B*. Bladder. *U*. Urethra.

on the external surface. Presently there is a depression in the skin which opens inward to this cavity, thus forming the cloaca. The cloacal opening is now divided into two parts by a septum, which later develops into the perineum. The posterior portion of the cloaca thus divided becomes the anus. The anterior part becomes the uro-

genital sinus. This sinus in its upper part becomes the urethra, and in its lower part the vulva.

The anomalies of the vulva and anus are:

Atresia.
Persistent cloaca.
Hypospadias.
Epispadias.

Atresia of the Urethra, Vagina, and Anus. The cloacal division by which the urethra, vagina, and anus are opened and thereby prolonged to the external surface may fail to take place. This failure will result in complete atresia of the vagina, urethra, and anus. The perineal septum may be absent, as shown in Figure 302, or present, as shown in Figure 303. In the latter case the opening between the rectum and the uro-genital sinus will be closed. This condition of complete atresia has only been observed in stillborn fœtal monstrosities. The bladder, urethra, and vagina—that is, the uro-genital sinus—are apt to be distended with urine.

FIGURE 302.

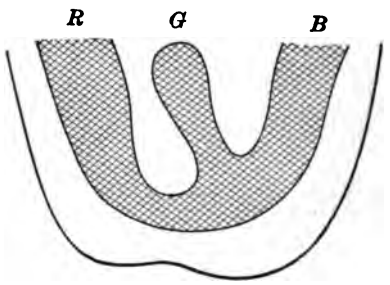


FIGURE 303.

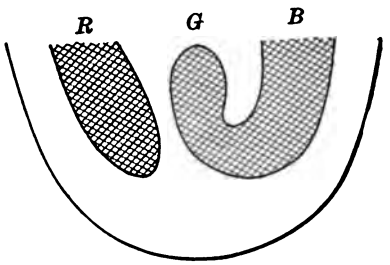


Figure 302.—Absence of cloacal division. Perineal septum wanting. *R.* Rectum. *G.* Genital canal. *B.* Bladder.
Figure 303.—Absence of cloacal division. Perineal septum present.[1]

Congenital atresia is not to be confounded with another form of vulvar atresia in which the labia have become adherent from inflammation. This adhesion may occur before or after birth. The adhesion is generally incomplete, so that urine and menstrual fluid can escape. The condition has been designated *superficial atresia of the vulva;* it is remediable by separating the labia, either by divulsion or by cautious dissection.

Persistent Cloaca. In this anomaly the anus practically opens directly into the vestibule; there is no perineum. The anomaly is a persistence of the condition in Figure 299. If the anal sphincter is also deficient, the condition is a pitiable one. When there is control over the feces an operation may not be absolutely needed; but when there is incontinence of feces it is always advisable, and preferably before maturity. The usual operation has been to pass a probe into the fistula and out at the normal position of the anus, then split up the parts, draw the rectum downward and backward to the angle of the incision, suture it into position, and close the gap in front. A

[1] After Schröder. From Pozzi, Treatise on Gynecology.

modification of this operater has been suggested by Buckmaster;[1] in this modification the new anus is first made just in front of the levator ani muscle, and at a later period the fibres of this muscle are split to make a sphincter.

Hypospadias in the female is a defect in the posterior wall of the urethra, or in extreme cases entire absence of the posterior wall. This makes a congenital vesico-vaginal fistula. It is a continuation

FIGURE 304.

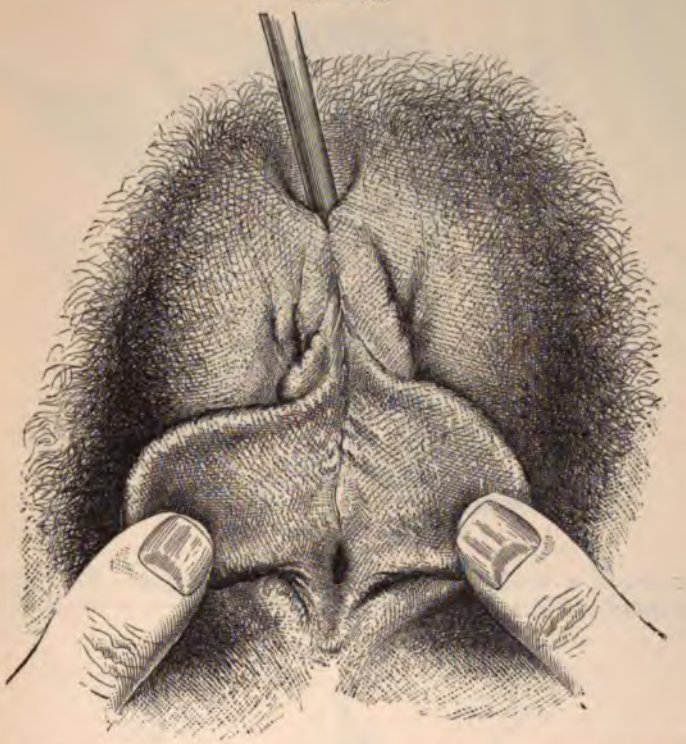
Hypospadias: congenital absence of the urethra. Sound passes from vagina directly into bladder. No retentive power.

of the fœtal condition in Figure 298, and is due to persistence of the uro-genital sinus. The lower portion of the allantois has partially or completely failed of development into a urethra. When the defect is only slight there is control of urine; the anomaly is often associated with hypertrophy of the clitoris. Sometimes there may be a question as to the sex of the individual. In extreme hypospadias an effort may be made by a plastic operation to make an artificial urethra. The method of Emmet is shown in Figures 304 and 305.

Epispadias in woman is a defect in the upper wall of the urethra, and generally is accompanied with fissure of the clitoris, and sometimes also with fissure of the symphysis pubes and of the whole anterior vesical wall. This gives rise to ectropion of the bladder. Incontinence of urine occurs even in the slighter forms, and an operation is required to restore the integrity of the bladder-wall. The labia are commonly absent in the extreme forms of epispadias.

[1] Transactions American Gynecological Association, xix. p. 275, 1894.

FIGURE 305.



New urethra made after Emmet's method, by denuding and uniting two strips, one on either side of the urethral site.

Other Congenital Anomalies.

Among the other congenital anomalies may be mentioned:

1. General want of development of the vulva and absence of the labia majora and minora. This is called infantile vulva.
2. Hypertrophy of the labia.
3. Anomalies of the clitoris and prepuce.

Infantile Vulva is commonly associated with defects of the internal genital organs and with a generally weak systemic development. It often coexists with chlorosis. It is not an absolute impediment to impregnation, but may be to parturition.

Hypertrophy of the Nymphæ has been much observed in the lower races, especially among the African tribes. It is said also to be found frequently in connection with hypertrophy of the mammæ among the American Indians.

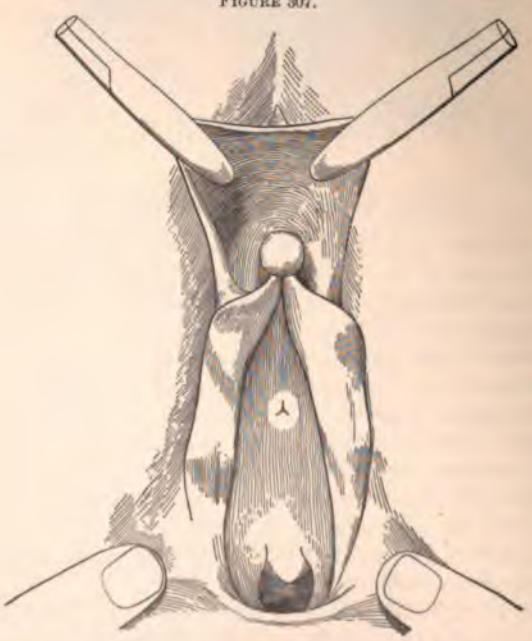
Anomalies of the Clitoris and its Prepuce. The clitoris will be recalled as that organ in the female which corresponds to the penis in the male. Hypertrophy of the clitoris may be congenital or acquired. If congenital and associated with the malformations, such as pseudo-hermaphrodism, the enlargement may be so extreme as to leave the

FIGURE 306.

Hypertrophy of the nymphæ.[1]

appearance of a penis; it is common in the tropics; for congenital enlargement see Hermaphrodism.

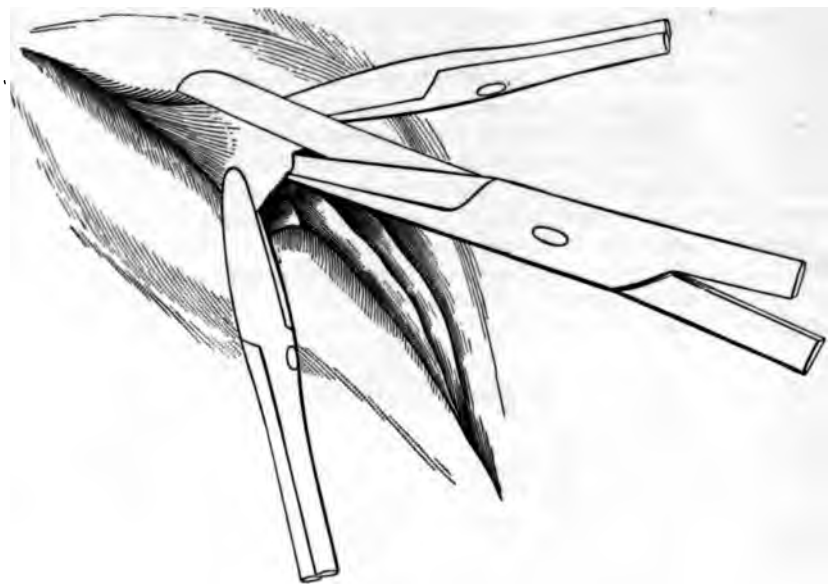
FIGURE 307.



Redundancy of the prepuce and enlargement of the clitoris in a masturbating child of eleven. Appearance of prepuce when put upon the stretch. Author's case.

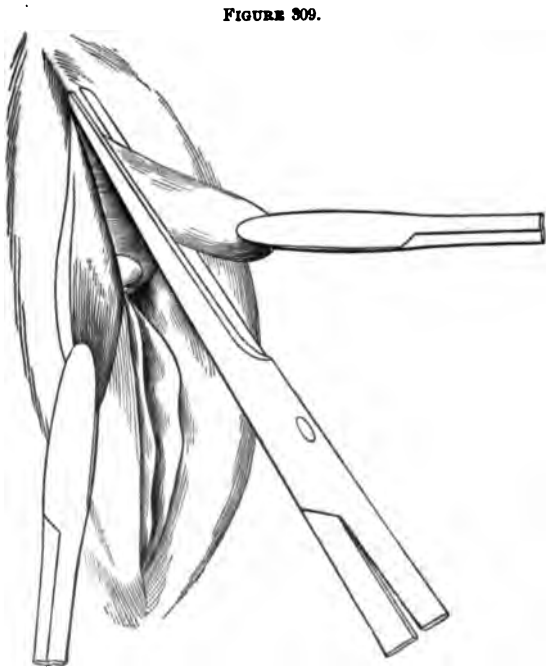
[1] Bonnet and Petit. Gynecology.

FIGURE 308.



Prepuce being divided on the dorsum of the clitoris, as would be done in a similar operation on the male. Same.

FIGURE 309.

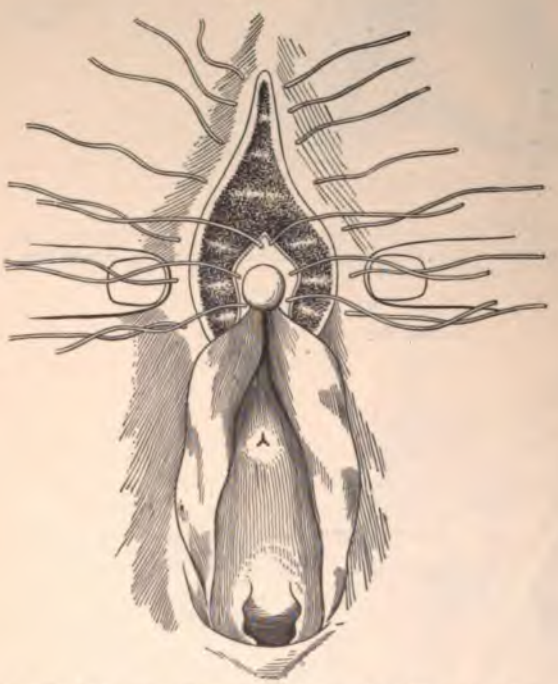


Right ride of the divided prepuce hanging loose, **with forceps attached. Left side being** removed with **scissors. Same.**

Acquired hypertrophy is usually the result of masturbation in childhood; enlargement due to this cause is not extreme.

There is a class of cases occasionally observed among children in which the clitoris is moderately enlarged and surrounded by an abundance of loose, flabby, redundant preputial skin. In such cases the causes may be both congenital and acquired. The congenitally hypertrophied clitoris and redundant prepuce are, by reason of their size, unduly exposed to friction; this gives rise to irritation; the child instinctively rubs or scratches the part in order to obtain relief, and thus gradually forms the habit of masturbation. This frequent counter-irritation and consequent congestion are then in themselves additional

FIGURE 310.



Redundant portion of prepuce all removed. Raw surfaces exposed and fine catgut sutures in place, ready to tie. Same.

FIGURE 311.

Sutures tied and wound united. Same.

causes of enlargement of the clitoris, and especially of redundancy of the prepuce. The child, unless relieved of the local irritation and taught to avoid all friction of the part, soon becomes a hopeless neurotic. The treatment in such a case is circumcision. The technique of the operation, which closely resembles that of circumcision in the male, is set forth in Figures 307, 308, 309, 310, and 311.

In the operation the same careful trimming of the loose, redundant skin is necessary as in circumcision of the male child. In suitable cases the operation, if supplemented by positive and proper moral instruction and by judicious hygiene, is usually followed by a cure of

the unfortunate habit and by relief from the nervous symptoms. A most important factor in the general treatment is a non-nitrogenous diet, the avoidance of sweets, spices, highly seasoned food, tea, coffee, and stimulating drinks. The importance of hygienic living is self-evident. Such cases are rare.

Adherent Prepuce. This may be congenital or acquired. It produces the same reflex nervous symptoms as in the male, and requires the same treatment—that is, to separate the prepuce from the glans either by breaking up the adhesions or by incision. In some cases the indication, after loosening the adhesion, is to slit up the prepuce on the dorsum. If the prepuce is not so redundant as to require removal, the wound may, as in the same operation in the male, be reunited by a line of union at right angles to the line of incision.

Hermaphrodism.

If we use the word hermaphrodism in its strict sense, to signify a combination of anatomically and functionally perfect male and female organs in one individual, a typical case has never been satisfactorily established. The condition occurs sometimes in the higher, but more frequently in the lower vertebrates, and it is perhaps possible in man, but thus far has not been demonstrated by the necessary autopsy.

The cases of so-called hermaphrodism all, or nearly all, fall under the head of pseudo-hermaphrodism, in which there may be an irregular development of the sexual organs, some of the female, others of the male type, but with a decided predominance of one over the other. If the individual is really a female, and resembles the male, the malformation is called Gynandry; if the male resembles the female, it is Androgyny.

Gynandry. There are two classes of cases.

In one class the breasts approach or conform to the male type. There may also be a hairy development on the face and a masculine voice, contour, and appearance. The genitalia are, however, present; and, although perhaps rudimentary, are yet unmistakably of the female type. There may be congenital atresia of the vagina and infantile vulva, but the uterus and ovaries, partly or fully developed, are present.

In the other class of cases the hairy development and masculine voice, contour, and appearance are supplemented by one or more of the following pronounced anomalies:

a. Pronounced hypertrophy of the clitoris, sometimes to the size and appearance of the fully developed penis.

b. The labia minora and majora may be fused together so as to obliterate the vulvar entrance.

c. Ovarian hernia and a consequent pouch may be present, resembling in form and situation a scrotum with its testicles. The uterus and ovaries are more or less perfectly developed.

Androgyny. Most of the cases of pseudo-hermaphrodism occur in individuals who have testicles, and are therefore essentially male. There are several forms of this class, of which three are given below.

1. The mildest form is that in which the breasts approach or conform to the female type, and the penis and testicles are correct in form, but rudimentary.

2. An interesting subdivision of androgyny includes individuals whose generative organs are apparently female, except that they have testicles instead of ovaries, these glands being situated in the abdomen or in the inguinal canal, and the scrotum being absent. The clitoris, vulva, vagina, and uterus, more or less imperfectly developed, are present. Individuals belonging to this subdivision are usually brought up and pass as women throughout their lives.

FIGURE 312.

Pseudo-hermaphrodism by hypospadias (male). *T.* Testicles, not descended. *S.* Symphysis pubis. *C.* Undeveloped penis, resembling large clitoris. *B.* Bladder. *V.* Prostatic vesicle (pseudo-vagina). *R.* Rectum. The penis in this figure is drawn smaller than in the original.[1]

3. The most numerous subdivision is that of hypospadic men. There is an imperfect, diminutive penis held down by a bridle, and having the appearance of a large clitoris. The pendulous portion of this penis is imperforate. The hypospadiac urethral opening corresponds in situation and appearance to the female urethra. The testicles are usually in the abdomen or inguinal canal, and the scrotum is therefore wanting. There is a fissure in the median perineal raphe—a perineo-scrotal fissure. The development on either side of this fissure resembles the vulvar labia. These individuals have the female mammary development, are usually brought up as girls, and in some instances have discovered the mistake only after marriage. Intercourse may be possible either in the prostatic vesicle,

[1] Sweifel, in Bonnet and Petit, Gynecology.

see Figure 281, or in the dilated urethra. Some of these monstrosities have been capable of coitus both as men and women.

The importance of hermaphrodism is obvious. As a clear diagnosis of sex in doubtful cases cannot always be made at birth, it is suggested that in cases of doubt the individual should be brought up as a boy. This course will cause less embarrassment, and in the vast majority of cases will prove to be correct.

The Treatment of Hermaphrodism is limited to those cases in which anatomical defect can be corrected by operative measures.

FIGURE 313.

Pseudo-hermaphrodite by perineo-scrotal hypospadias.[1]

The labia, if fused together, may be separated by breaking the adhesions or by incision. The hypertrophic clitoris or labia may be removed and the wounded surfaces covered by means of a plastic operation.

The bridle or frænum holding down the penis in androgyny may require an operation for the liberation of the organ, and plastic work for the covering of the exposed surfaces.

Epispadias and pseudo-hermaphrodism may furnish indications for operative measures, and if so, must be treated in each case according to the special requirements.

[1] From Bonnet and Petit, Gynecology.

CHAPTER XXXVIII.

CONGENITAL GYNATRESIA WITH RETAINED MENSTRUAL FLUID.

ATRESIA in the genital tract of a menstruating woman results in retention of the menstrual fluid above the point of obstruction. The fluid thus retained is of a tar-like color and consistency. It contains blood, mucus, and epithelial débris. Its consistency and color are due to partial absorption of the fluid constituents.

Figures 314 to 325 show the accumulations of menstrual fluid which may take place above the various possible points of atresia in the uterus, vagina, or vulva. The accumulations come under one of the three following divisions:

1. An accumulation in the vagina. The distention will take place above the point of vaginal or vulvar atresia, and is called *hæmatocolpos*.

2. An accumulation in the uterus called *hæmatometra*. It is limited below according as the atresia is at the internal or external os, in the corpus, or in the cervix uteri. A distended cervix is called hæmatotrachelos.

3. The uterus having been distended, the blood may force its way into and distend the Fallopian tubes, producing *hæmatosalpinx*. The fimbriated extremity in such cases is closed by adhesive inflammation. Hæmatosalpinx due to retention of menstrual blood is usually associated with hæmatometra.

Hæmatocolpos may exist alone or may be associated with hæmatometra and hæmatosalpinx.

The Pathological Results.

The pathological results are primarily those of pressure upon the mucosa, and distention and thinning of the walls of the dilated organs; this leads to atrophy of the mucosa and muscularis. Secondarily, there may be infection and consequent admixture of pus with blood; the conditions may then be termed pyocolpos, pyometra, and pyosalpinx.

Symptoms.

The symptoms are commonly absent until puberty; at this time menstruation first begins and gives rise to the accumulations of menstrual blood. The young girl will then have the symptoms of

monthly recurring menstruation called the *molimen*, with the sense of superadded weight and heaviness due to accumulations of menstrual fluid. The sense of weight will increase with the quantity accumulated, and in cases of extreme hæmatometra will become excessive, and may resemble labor pains. There will also be distressing pressure on the adjacent organs. Suppuration, if present, gives rise to the same symptoms of absorption as would result from an abscess.

Diagnosis.

The physical signs will reveal a fluctuating elastic tumor corresponding to the seat and extent of the accumulations. The tumor, if in the vagina, will be felt most distinctly in that region, and may

FIGURE 314.

FIGURE 315.

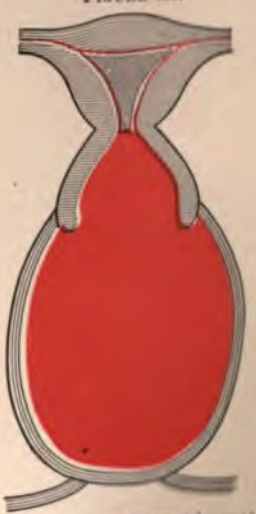


Figure 314.—Atresia at the vulva first causes distention of the vagina, producing hæmatocolpos.
Figure 315.—Atresia at the vulva. Hæmatotrachelos has followed hæmatocolpos.

bulge between the labia; if in the uterus and tubes, it will easily come within reach of the external hand on conjoined examination, and fluctuation will be distinct on palpation between the vagina and hypogastrium. The distended tubes are usually made out to either side of the distended uterus. Conjoined examination with the left index-finger in the rectum may give further information. The finger in the rectum and the sound in the bladder will sometimes define the upper limits of hæmatocolpos.

If the atresia is at the os internum, it gives rise to no change in the form of the cervix, but gives to the corpus uteri the appearance of pregnancy.

One side of a double vagina or uterus may be distended and the other side empty. There will then be a tumor on the affected side

[1] Figures 314 to 325 suggested by and modified from Sutton and Giles's Manual of Diseases of Women.

and lateral displacement by pressure. The symptoms, supplemented by conjoined examination and the sound, will be the means of diag-

FIGURE 316.

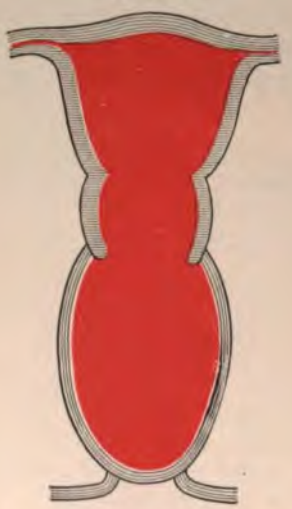


FIGURE 317.

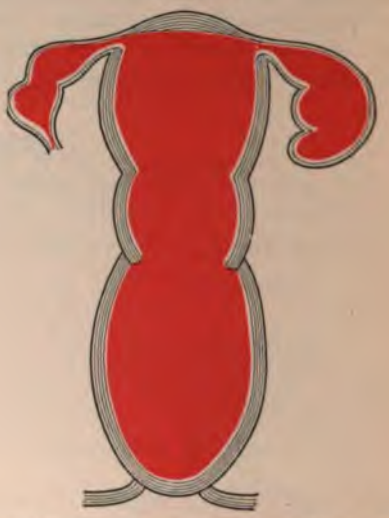


Figure 316.—Atresia at the vulva has caused hæmatocolpos, then hæmatotrachelos, and then hæmatometra.

Figure 317.—Atresia at the vulva. In addition to the conditions in Figure 316, there is added hæmatosalpinx.

FIGURE 318.

FIGURE 319.

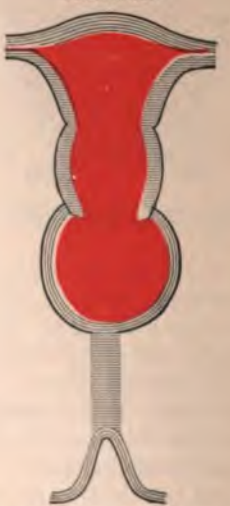


Figure 318.—Atresia in the vagina midway between the vulva and os externum, causing hæmatocolpos in the upper half of the vagina.

Figure 319.—Same as in Figure 287, except that distention of the whole uterus has followed the partial hæmatocolpos.

nosis. The groove between the distended and empty sides may be felt on rectal touch.

Hæmatometra is distinguished from pregnancy by the absence of the usual signs of pregnancy, especially of discoloration, patulous os

FIGURE 320.

FIGURE 321.

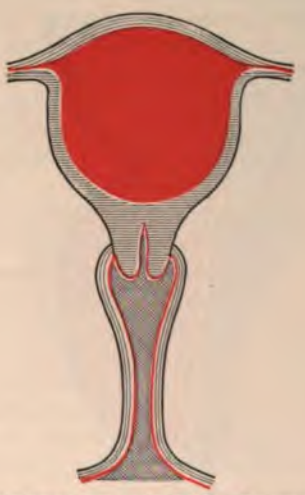


Figure 320.—Atresia at the os externum producing a hæmatotrachelos. Corpus uteri not yet distended.

Figure 321.—Atresia at the os internum producing hæmatometra. Fallopian tubes may become distended later.

FIGURE 322.

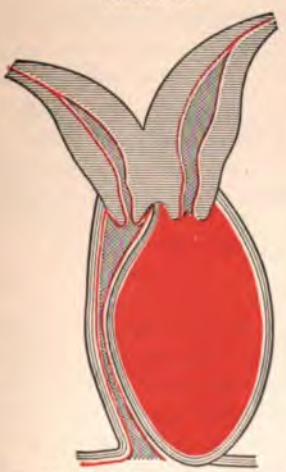


FIGURE 323.

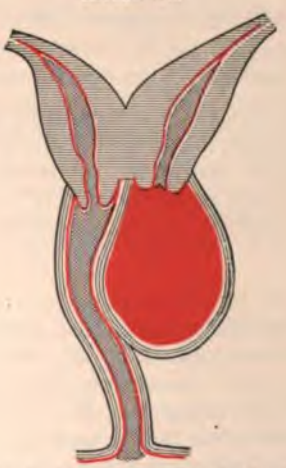


Figure 322.—Atresia at the vulva on one side of a double uterus and vagina, causing hæmatocolpos on affected side.

Figure 323.—Atresia on one side of double uterus and vagina midway between vulva and os externum. This produces partial hæmatocolpos of affected side.

externum, and vaginal pulsation. Hæmatocolpos or hæmatometra on one side of a double uterus or vagina may lead to great confusion. Conjoined examination and the history of the case will serve to dis-

tinguish the former from extra-uterine pelvic tumors, and the latter from abscess or cyst of the vaginal wall.

The greatest care in manipulation is essential lest the sac rupture

FIGURE 324.

FIGURE 325.

Figure 324.—Atresia on one side of double uterus and vagina at vulva, producing hæmatocolpos, hæmatotrachelos, and hæmatometra.

Figure 325.—Atresia on one side of double uterus and vagina at os externum, producing hæmatotrachelos and hæmatometra.

and discharge its contents into the peritoneum, or the fluid be forced through the Fallopian tubes. The fluid, however, is apt to be sterile.

Prognosis.

Unless relief comes from operation, the thin walls, especially of the Fallopian tubes, may rupture and set up dangerous peritonitis. Suppuration may give rise to all the dangers incident to pelvic abscess. If the sac ruptures into the intestine, there may be dangerous infection and death, or a precarious recovery.

Treatment.

The treatment is free incision at the point of atresia, evacuation of the accumulated fluids, washing out and drainage of the cavity. There is in these cases an unexplained and excessive liability to post-operative infection. Extra care therefore in the asepsis before, during, and after the operation is imperative.

Operations for Hæmatometra will vary according to the location and extent of the atresia. In some cases the obstruction is slight and easily broken by a sound or by pushing a pair of blunt-pointed scissors or forceps through it, and spreading the blades to secure the necessary divulsion and dilatation. The canal once opened should be made to remain patulous, if necessary, by immediate free incision or dilatation. The atresia may be at the internal or external os, or the

whole cervical canal may be obliterated. In the latter case it is sometimes necessary to separate the bladder from the uterus as in anterior vaginal section. The separation does not necessarily extend into the peritoneum, but should be carried past the level of the internal os. The anterior wall of the uterus may then be divided longitudinally with scissors until the interior of the corpus is reached and evacuated. The opening thus made is rendered permanent by additional incision, gauze packing, or dilatation, or all of these combined.

Hæmatometra may occur with complete or nearly complete absence of the vagina. See Malformations of the Vagina. Under these conditions the choice of procedure is between :

1. Artificial vagina.
2. Abdominal hysterectomy or removal of the appendages.

1. *Artificial Vagina* consists in separating the vesical from the rectal plate of the recto-vaginal septum and entering and evacuating the uterus through the canal thus made. The incision is first freely made from side to side through the vulvar skin ; the two plates of the recto-vesical septum are then readily split apart by means of the two index-fingers, which easily work their way through loose cellular tissue to the uterus. The uterus will be recognized, when reached, by its relative hardness and resistance, and by the elasticity and sense of fluctuation imparted by the retained fluid. It is opened by means of the sharp-pointed scissors, using as a guide the aspirator needle previously introduced. In working his way to the uterus, the operator may avoid entering the bladder or rectum by frequently introducing the finger into the rectum and the sound into the bladder.

The only objection to this method is the strong tendency of the artificial vagina to contract and become obliterated. This is prevented by the constant wearing of the Sims glass vaginal plug. Emmet says that finally, in some cases, the new vagina when it heals over glass is covered by a structure not altogether unlike mucous membrane, and that after healing has taken place the frequent use of the glass dilator will keep the vagina open. The writer's experience in three cases personally observed is that no such membrane formed ; but that, on the contrary, the surfaces were entirely cicatricial or granulating in character.

2. *Abdominal Hysterectomy or Removal of the Ovaries.* If the artificial vagina persistently contracts and cannot practically be kept open as an outlet for menstrual fluid, the removal of the uterus would be justifiable and preferable to removal of the ovaries.

Operations for Hæmatocolpos. If the obstruction be only a thin membrane, it may be freely incised and the fluid let out as in hæmatometra. In some cases there is absence of the lower and distention of the upper part of the vagina, and perhaps also of the uterus and Fallopian tubes. A passage must then be carefully made to the point of atresia for opening the vagina in hæmatometra. The patency of the vagina is maintained by the constant or frequent use of the glass vaginal plug. If the atresia is in the very lower part of the vagina, the labia or skin about the vulva may be dissected loose and trans-

planted so as to cover the raw vaginal walls. Contraction from progressive cicatrization may in this way be prevented.

An operation for hæmatocolpos or hæmatometra on one side is apt to result in closure of the opening and refilling of the cavity. For this reason it is important, in the effort to secure a permanent result, to include in the operation the free division of the septum in the vagina and, so far as practicable, in the uterus.

In hæmatosalpinx the tubes will usually empty themselves through the uterus when that cavity is drained, and do not therefore have to be removed.

Hæmatocolpos and hæmatometra may be the result of traumatic as well as of congenital atresia; the principles of treatment are then the same as for the congenital anomaly—that is, to let out the confined fluid and adopt measures to keep the passages open.

The formation of an artificial vagina in cases of vaginal atresia and rudimentary uterus has in rare instances been followed by development of the uterus and normal menstruation, and may therefore possibly result in maternity. The probability of such a result, however, is so slight as to discourage the operation.

It occasionally happens that complete atresia of the vagina and absent or extremely rudimentary uterus are not discovered until after marriage. In such a case maternity is clearly impossible. The question may then arise whether or not the formation of an artificial vagina is justifiable. Cases have been reported in which after the operation marriage was happy, the woman even recovering from a tendency to melancholia, and experiencing great improvement in nervous tone and general strength. The operation, if performed, follows the technique already laid down for the formation of artificial vagina in cases of hæmatometra; the question of its propriety may safely be relegated to the department of ethics and casuistry.

PART IV.

TRAUMATISMS.

CHAPTER XXXIX.

NON-PUERPERAL INJURIES TO THE VULVA, VAGINA, AND CERVIX UTERI.

Injuries to the Vulva. The external genitals are protected from violence by their situation and relations to the surrounding parts, and are therefore little exposed to external traumatism.

Etiology. The following causes are most frequent: 1. Falling upon a sharp substance. 2. Self-inflicted wounds by the insane. 3. Violent coitus. 4. A blow or fall which so bruises the soft parts against the sharp edges of the descending ramus of the pubes or the ascending ramus of the ischium as to make a deep cut. The cut may appear at the surface or may be subcutaneous.

The Symptoms. The symptoms are the same as those of similar injuries elsewhere. Hemorrhage from the abundant vessels about the vulva is usual in wounds of that region. When the wound is external the bleeding may be alarming—even fatal. Great subcutaneous extravasation of blood may occur in the bruised parts. This when clotted forms *pudendal hæmatoma.*

Treatment. Superficial incised wounds should be treated by suture. Bleeding points should be ligatured by fine catgut. Deep punctured wounds are best treated by compresses, which serve for dressings and to control hemorrhage. Small hæmatomata may disappear by absorption; if too large for absorption, compresses should be applied for four to eight days, until all danger of hemorrhage has passed. Then a free incision should be made, the clot turned out, the cavity packed with aseptic gauze and allowed to heal from the bottom. Suppuration is treated by incision and drainage.

Injuries to the Vagina and Vaginal Portion of the Cervix Uteri of non-puerperal origin are more rare than injuries to the vulva. They may result from violent coitus or from the violent application of any other force. The control of hemorrhage and the repair of vaginal wounds follow the general principles of surgery.

CHAPTER XL.

THE PERINEUM AND PERINEAL REGION.

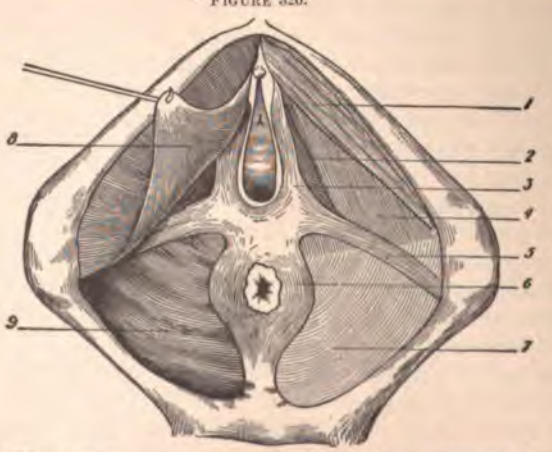
Anatomy. Functions. Puerperal Lacerations.

INJURIES to the vaginal outlet and pelvic floor caused by parturition, and usually designated as lacerations of the perineum, are among the most frequent of gynecological lesions. Even though their importance be sometimes overestimated, the fact is undeniable that they give rise to many serious disorders and inconveniences. It is not always possible to avoid the accident, but it is possible to recognize it when it occurs and, by a timely operation, prevent its evil consequences. The duty of the obstetrician includes, therefore, a careful examination of the vaginal outlet immediately after labor, and another toward the end of the puerperium several weeks later. The latter examination is necessary because some of the worst injuries are not at first apparent. A laceration that does not extend into and involve the sphincter ani muscle is called *incomplete*. If the sphincter is sufficiently injured to impair its functions—*i. e.*, if the patient has lost the power to retain the contents of the bowel—the laceration is *complete*.

Anatomy of the Perineum and Perineal Region.

Figures 326 and 327 show the component parts of the perineum. It is the converging point where many of the most important parts of

FIGURE 326.



1. Erector clitoridis. 2. Bulbo-cavernous muscle. 3. Constrictor vaginæ muscle. 4. Triangular ligament. 5. Transversus perinei muscle. 6. Sphincter ani muscle. 7. Fascia of the levator ani muscle. 8. Perineal fascia. 9. Levator ani muscle.

the pelvic floor come together. These supports are: the bulbo-cavernosus muscle; the transversus perinei muscles, superficial and deep fascia; the external sphincter ani muscle; the internal sphincter ani muscle; and the levator ani muscle. These muscles are surrounded and bound together by deep and superficial fascia; in some places, for example the triangular ligament, it is quite dense, ligamentous, and resisting. All the perineal muscles, through the medium of tendon and fascia, are strongly connected with the pubic bones.

FIGURE 327.

Right side, showing vesico-rectal fascia.

Even the sphincter ani, a muscle of special functions, which is attached posteriorly to the tip of the coccyx, is closely united to the other muscles of the perineum, and, therefore, indirectly to the pubic bones by interlacing of its fibres with theirs and by its tendinous and fascial attachments. The muscles, ligaments, and fasciæ unite in the perineum to form a diaphragm which fills the pelvic outlet.[1] Through this diaphragm pass the lower portions of the rectum, anus, vagina, and urethra.

Functions of the Perineum and Perineal Region.

It is clear from the foregoing paragraphs and illustrations that the muscles, fasciæ, and ligaments of the perineal region constitute a most essential supporting part of the pelvic floor. They surround, bind together, hold in position, support and maintain in their mechanical relations the terminal ends of the rectum, vagina, and urethra. The reader is now prepared to take exception to the common notion that the pelvic organs derive their support from the small fleshy body called the perineum. Another false idea is that the support is in the nature of that given by a keystone to an arch. The perineal region

[1] Adapted from Skene. New York Medical Journal, March 14, 1885.

and perineal body do not give support in the sense of being under the pelvic floor and holding it up as foundations. They are an essential and integral part of the pelvic floor, and as such contribute to its make-up and to the support of the abdominal organs above. It is equally untrue that the muscles, especially the levator ani, are continually active; constant activity of muscles would be unphysiological, for such tension would soon destroy their power. The recto-vaginal fascia, see Figure 327, is in itself sufficient, when intact, to afford the

FIGURE 328.

Normal relations of the pelvic organs, showing the vaginal walls resting on the perineal body.

required support. Moreover, the perineal muscles do not fix the parts to which they are attached. They serve to control the lower portions of the rectum, vagina, and urethra in the performance of their functions.

The importance of the levator ani muscle as a means of support has been overestimated; on this subject a very suggestive, convincing, and clear statement comes from William W. Browning, of Brooklyn.[1] His conclusions are as follows:

"1. That in the human subject it belongs to the class of rudimentary muscles.

"2. That the weakness of its origin, as well as the direction and the insertion of its fibres, is inconsistent with such design.

[1] Medical News, June 12, 1897.

"3. That it is unphysiological for a muscle to furnish a continuous support.

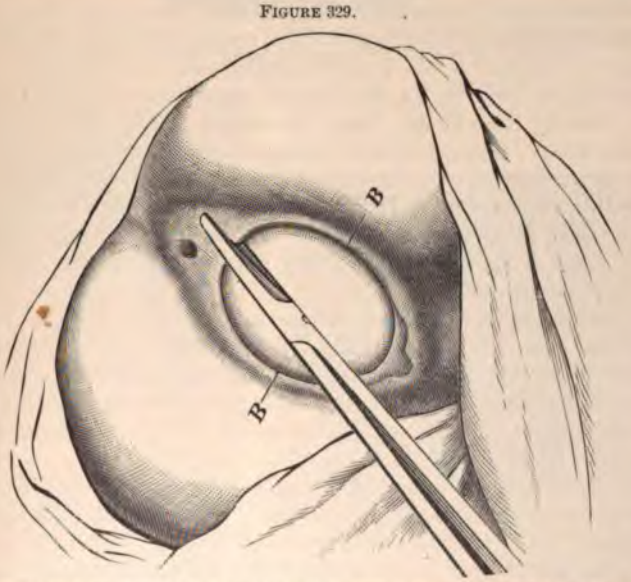
"4. That the recto-vesical fascia is in itself sufficient, when intact, to afford the required support.

"5. That the muscle is no better developed in the female (in whom support is more required) than in the male."

Lacerations of the Perineum.

A mere rupture in the perineal body where certain muscles, fasciæ, and ligaments of the pelvic floor converge is not necessarily very significant. If, however, the injury involves the rending asunder of these supports, especially the fascial supports; if they are so divulsed as to lose their sustaining power; and, above all, if they are torn off from their pubic attachments, the lesion becomes more serious.

FIGURE 329.



Correct incision in episiotomy. Lines *B B* show incorrect place for incision.

Causes and Prevention. Relative disproportion between the child and the perineal outlet may, unless an incision is made, render laceration inevitable. Among other unpreventable causes are rapid labor and œdema of the vulva. The preventable causes and the means of protecting the perineum during labor are fully laid down in works on midwifery. If during labor rupture seems imminent, it is better to divide the vulvar ring by an incision known as episiotomy, and thereby substitute for a ragged, lacerated wound, which may perhaps involve the sphincter muscle, a clean cut in another direction. The usual method of episiotomy is to make a transverse incision through the middle of the labium majus on each side. The

objections to these incisions are that the rents may extend still further laterally as the head passes, and an additional fresh tear may occur at the posterior commissure of the vulva. This would make three wounds, all in awkward directions. In place of this a single incision in the direction and location shown in Figure 329 is preferable. If the tear extends beyond the incision, its direction does not imperil the sphincter ani muscle.

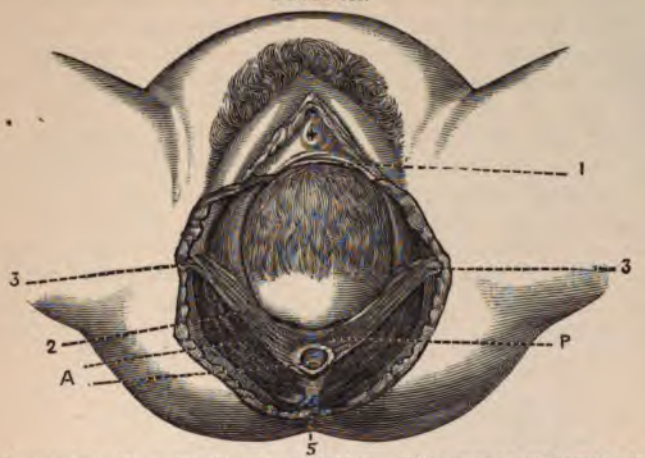
Complete Laceration through the sphincter ani muscle entirely destroys the retentive power of the bowel. The rupture in rare instances occurs subcutaneously without a visible break in the cutaneous surfaces around the anus. Relaxation of the sphincter and incontinence of the bowel may also occur independently of laceration. The diagnosis then depends upon the presence of an open, relaxed anus. Complete laceration, being usually in the median line, does not tear the supports of the pelvic floor as much as the incomplete.

The Results of Incomplete Laceration vary with the extent of injury and direction of the tear. The extent to which the laceration is visible to the eye is not a safe criterion, for, as already explained, the chief injury may be in the deeper structures, and recognized not by sight, but by the effects. The effects may not be apparent immediately after labor; hence further examination is a necessary part of the efficient management of the puerperium. One examination should be made immediately after labor, to recognize and at once repair such injury as may at that time be visible; another six weeks later, to recognize and repair, if present, any deeper injuries to the perineal fascia or muscles.

The direction of the tear is most significant: if it is in the median line, the muscles, fasciæ, and ligaments are not so seriously injured; on the other hand, a tear extending transversely across the perineum, especially if these structures are torn apart or torn from their pubic attachments, may give rise to the more serious lesions to be described later.

Figure 330 shows the child's head pressing strongly downward upon the transversus perinei and the bulbo-cavernous muscles and their fascia. This powerful downward pressure gives rise to great sagging of the pelvic floor; and if the recto-vesical and other fasciæ are extensively injured, the sagging, unless relieved by a suitable perineorrhaphy, is apt to be permanent. In such a case the direction of the tear is usually transverse, not median. After the injury the whole pelvic floor, including the rectum, vagina, urethra, and bladder, now deprived of their support, tend to downward and backward displacement toward the tip of the coccyx. The result is similar to that of cutting the guy ropes of a tent. The rectum, bladder, and vagina fall, as the lower jaw would fall if the masseter and temporal muscles were cut. The backward displacement of the perineum is an incident and an index of the sagging. In very many of the worst cases the injury is mainly intra-vaginal, and shows little or no external evidence of laceration—that is, the cutaneous structures between the anus and the posterior commissure of the vulva may be unbroken. The palpable,

FIGURE 330.



Downward pressure on the pelvic floor in parturition. This figure shows how the transversus perinei and bulbo-cavernous muscles and fascia may be injured.[1]

FIGURE 331.

FIGURE 332.

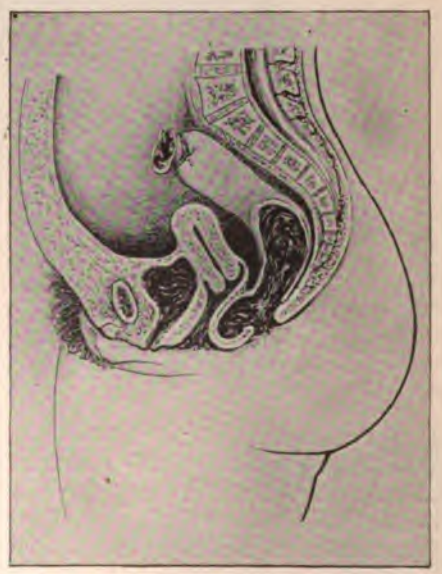


Figure 331.—Front view of a rectocele. Perineum more relaxed than torn.[1]
Figure 332.—Sectional view of a rectocele. Perineal body impaired.[2]

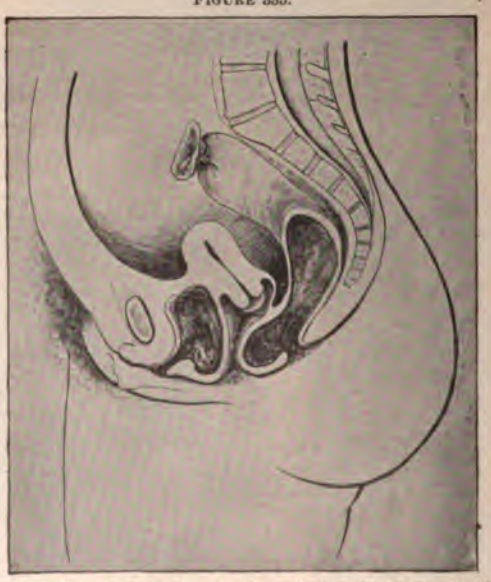
visible split perineum may have relatively little significance; but injury to the recto-vesical fascia and to the other fasciæ of the pelvic

[1] American System of Gynecology. (After Coe.)
[2] Thomas and Mundé. Diseases of Women.

floor gives rise to most serious displacements and nutritive disorders. The injury to the muscular part accounts less for the displacements than for the associated impairment of function in the organs which the muscles control—that is, in the bladder, urethra, vagina, and rectum.

Rectocele. Figure 328 shows the direction of the anus to be at an angle to that of the rectum, so that as fecal matter comes down it must, in passing from the rectum out through the anus, turn this angle; in so doing it strikes against the rectal side of the perineum, and is thence deflected through the anus. If the injury to the perineal body has made it thin, weak, or relaxed, or otherwise impaired its resisting power, the downward force of the feces, instead of being deflected backward and outward, will cause the posterior vaginal wall

FIGURE 333.



Section of rectocele and cystocele. Perineal body impaired.[1]

to pouch forward into the vagina. This pouch is a *rectocele.* The fecal matter thus arrested requires, with the enlarging pouch, more and more force for its expulsion, and the pouch will therefore increase; the result will be rectal and anal tenesmus, irritation, and sometimes anal fissure or fistula, or hemorrhoids.

Cystocele. The perineum having been impaired by rupture, the vesico-vaginal septum, which normally rests upon it, tends to sag and bulge forward into the vaginal outlet in the form of a pouch. This pouch is called *cystocele.* The patient, except in the knee-chest position, cannot completely empty the bladder, residual urine accumulates in the pouch, decomposes, irritates the bladder, and may set up cystitis or may even lead to the formation of stone in the bladder.

[1] Thomas and Mundé. Diseases of Women.

Often, during stool, women are obliged manually to hold back the protruding organs in order to empty them.

The downward force of straining at stool to empty the bladder and rectum increases the prolapse of the vaginal wall, which, being attached to the uterus, drags that viscus, together with its appendages and the rest of the pelvic floor, to a lower level, and thereby gives rise by traction to various displacements of the reproductive organs.

A wide range of organic and mechanical disorders naturally result from the above conditions; among them hypertrophy and swelling

FIGURE 334.

Front view of cystocele and rectocele.[1]

of the vaginal walls, bearing-down sensations, a feeling that the "bottom has dropped out," difficulty of walking and standing, backache, constipation, and many nervous disturbances.

Owing to the unguarded state of the entrance, air may accumulate in the vagina, and at intervals, on slight change of position, be suddenly expelled with an audible sound. Chronic nervous invalidism is the possible indirect result of laceration of the perineum. This subject is further discussed in the chapter on displacements.

[1] Thomas and Mundé. Diseases of Women.

CHAPTER XLI.

PERINEORRHAPHY.

ALTHOUGH some relief is often possible from the artificial support of a pessary, perineorrhaphy is usually necessary to a satisfactory cure. This operation in a properly broad sense comprises not merely the closure of the torn perineum, but as well the repair of the injuries, both deep and superficial, of other structures in the perineal region.

One of the most important and most serious maxims in gynecology should be, "Never attempt the primary or secondary closure of a torn perineum until you have fully and clearly demonstrated and appreciated the direction or directions and extent of the injury."[1]

Direction of the Tear.

A number of years ago the writer was called to make immediate repair of an incomplete though extensive rupture of the perineum. He had the belief, then commonly received, that such a rupture was usually a splitting apart of the perineal body into two lateral fragments which at once retracted to the corresponding sides. Accordingly, sutures were introduced from side to side in a way to reunite the lateral fragments by a line of union which should extend in the median line from the cutaneous to the vaginal side of the perineal body. The amazing result of this procedure was almost complete closure of the vulva. The index-finger could only with difficulty be introduced into the vagina.

The absurdity of the situation was more apparent than the explanation; evidently the lacerated surfaces had not been properly brought together—but why? Upon removal of the sutures the torn surfaces were again exposed. A study of the injury was then made by hooking together opposite sides of the torn surfaces in different directions with tenacula. The result of the experimental approximation finally demonstrated the direction and character of the rent.

The four diagrams under Group I., Figure 335, explain the nature of this lesion and the operation of repair. Diagram 1 shows the margins of the wound before approximation. Diagram 2 shows the approximation, the correctness of which was demonstrated by the fact that all the little irregularities accurately fitted into one another, and that the normal integrity of the vaginal outlet was restored. Diagram 3 shows the sutures in position, but not tied. Diagram 4 shows the lines of union and the sutures tied. The line *abc*, Diagram 4,

[1] E. C. Dudley. Chicago Clinical Review, April, 1894. The accompanying description of perineorrhaphy is adapted from this paper.

represents the line of tear extending from side to side across the vaginal outlet inside the vulva; the point *b* is situated in the median line; points *a* and *c* represent the extremities of the vaginal portion of the rupture, which extended high up across the lateral walls of the vaginal outlet in a direction parallel to the sides of the vulva. The arrow-heads show the directions in which the fragments retracted after the rupture until the exposed surfaces assumed the shape shown in Diagram 1.

The explanation of the closure of the vulva by the first procedure is now clear. It was the result of a line of union made at right angles to the actual line of tear—that is, the vaginal portion of the rupture had been from side to side, or in the transverse direction; it was closed as if it had been a longitudinal instead of a transverse tear. This would necessarily close the vulva to a point as high as the injury extended on either side.[1]

In order to explain clearly the mechanism of the rupture shown in Group I., attention is called to another form of rupture, known as complete central rupture of the perineum—that is, a rupture in which the child is produced not through the vulva, but through a perforation extending from the vaginal side of the perineal body, directly through the perineal body to its cutaneous side, where the birth is completed between the vulva and the anus. This complete, central rupture of the perineum takes place in the transverse, not in the longitudinal direction. The transverse direction is determined by the general arrangement of the muscles and fascia surrounding the vulva, the fibres of which run for the most part in that direction and are therefore more readily separated than torn asunder.

The vast majority of lacerations commence as in complete central rupture, following the direction of least resistance—that is, transversely; and continue until considerable progress has been made in the separation of the perineal structures into anterior and posterior fragments (line *abc*, Group I., Diagram 4). Then, instead of continuing to the completion of the central rupture and the perforation of the perineal body, the expulsive forces are more and more opposed by the strength of the deeper perineal structures, the direction of least resistance changes to the longitudinal, with a corresponding change in the direction of the rupture, which now takes the longitudinal direction shown in line *bf*, Diagram 4. Again, notice the direction of retraction of the three torn fragments as shown by the arrow-heads in Diagram 4, a retraction which makes the irregular, torn surface of Diagram 1. The exposed surface of Diagram 1, being partially intravaginal, often requires for its demonstration the

[1] At the meeting of the American Medical Association in June, 1883, I described the transverse laceration of the perineum and its operative treatment. The paper was published in the Transactions of the Association of that year. This paper had reference only to the recent laceration and the immediate operation. In the first edition of Emmet's Principles and Practice of Gynæcology, which appeared about six months later, that author gave to the profession the epoch-marking operation on the vaginal outlet which has since been known by his name. Emmet's observations had special reference to the secondary operation, and were made without knowledge of my studies upon the recent laceration, as mine were made without knowledge of his work in the secondary operation. It is the great credit of Emmet to have given to the profession a secondary operation which brings the posterior vaginal wall up against the anterior more perfectly than any other; this operation, however, though of wide, is not of universal, application. Besides, there are some matters of technique, soon to be described, which add greatly to the result in bringing the perineum up to the pubes.

FIGURE 335.

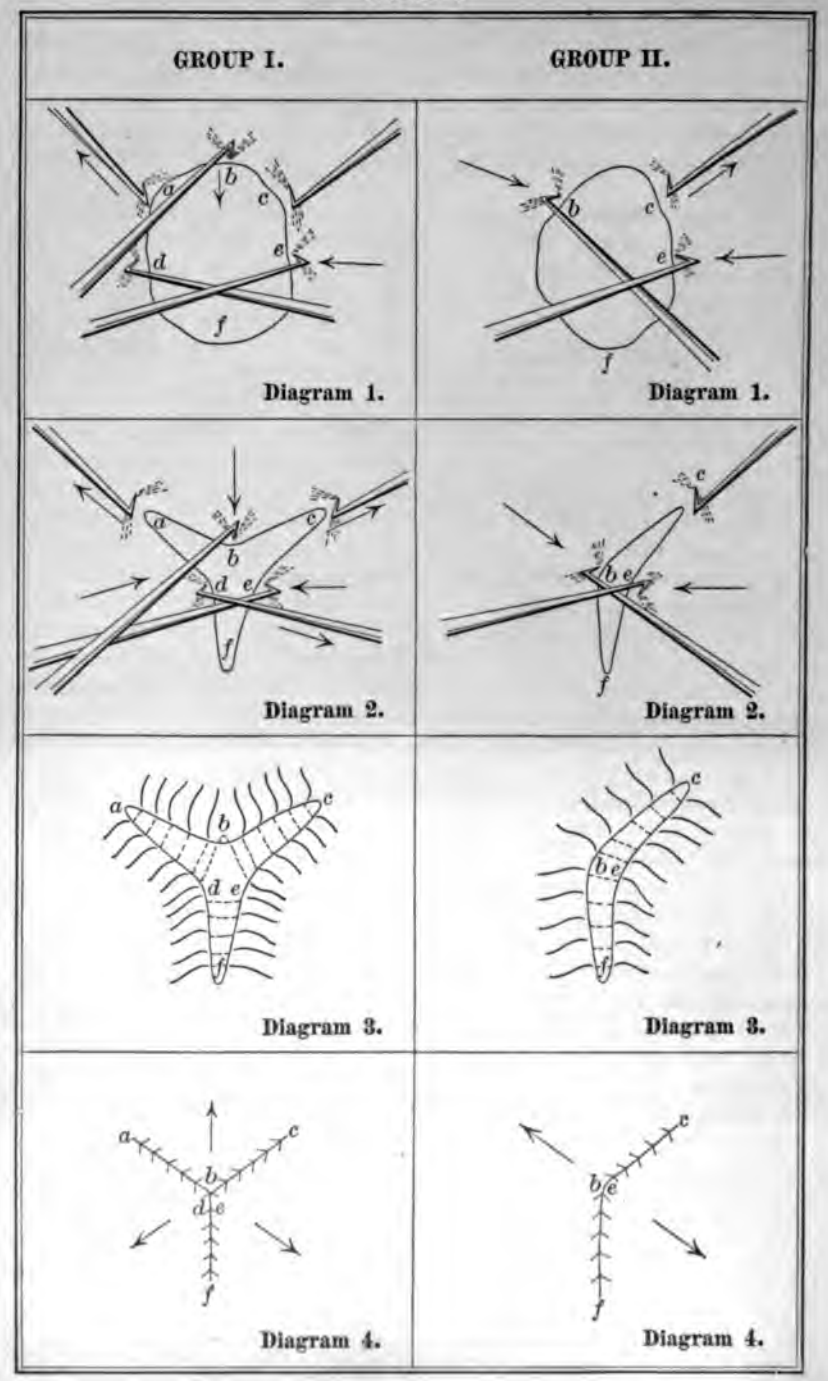
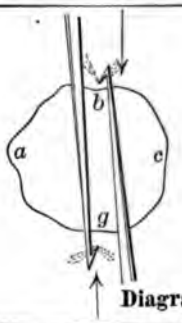
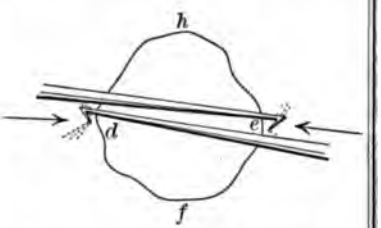
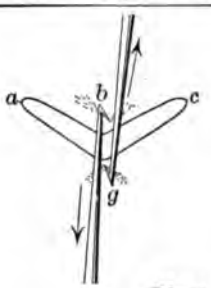
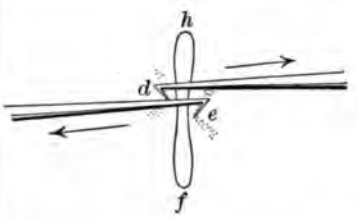
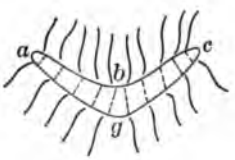
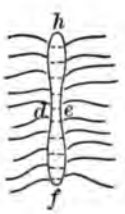
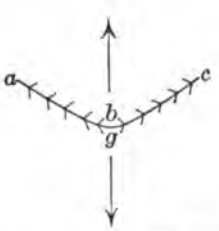
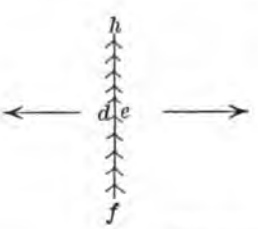

GROUP I.
GROUP II.
a
b
c
d
e
f
Diagram 1.
Diagram 1.
Diagram 2.
Diagram 2.
Diagram 3.
Diagram 3.
Diagram 4.
Diagram 4.

FIGURE 386.

GROUP III.	GROUP IV.
 Diagram 1.	 Diagram 1.
 Diagram 2.	 Diagram 2.
 Diagram 3.	 Diagram 3.
 Diagram 4.	 Diagram 4.

sides of the vulva to be separated, or the perineum to be lifted forward by the index and middle fingers in the rectum.

The diagrams in Group I. represent a typical perineal laceration; the other three groups of Figures 335 and 336 show various modifications of this type. In all these four groups Diagram 1 represents the exposed, torn surface of the bruised and distorted vaginal outlet, which approximate in each instance a polygon or a circle bounded by a broken outline. It is an interesting fact that the description of any one of these torn surfaces will without change apply perfectly well to any other—that is, when the labia are separated, the outline of the torn surfaces does not necessarily give a definite idea of the direction of the rent. For example, the rent may be in the antero-posterior direction, and the two lateral fragments may have retracted to the corresponding sides, making the outline of the laceration as shown in Group IV., Diagram 1; or the rent may have occurred transversely, and the torn fragments may have retracted, the one toward the vaginal outlet and the other toward the upper end of the vagina, leaving a similar torn surface, the outlines of which are shown in Group III., Diagram 1. This indefiniteness in the shape of the outlines of the exposed surfaces in the four groups is not only consequent upon the retraction of the torn fragments, but it is also caused by the loose, flabby, contused, rasped condition of the vaginal outlet—a condition common at the end of parturition.

Notice Diagram 4 in each of the four groups. In Group I. the lines of the tear correspond approximately to the shape of the letter Y. The upper part of the letter describes the transverse, vaginal portion of the tear; the staff describes the longitudinal, vulvo-vaginal portion. We really have three distinct lines of rupture: one shown by the line *ab*, another by the line *bc*, and the third by the line *bf*. Lines *bc* and *bf* of this figure describe the rupture of Group II. In Group II. the vaginal portion of the rupture runs diagonally to the patient's left. A precisely similar condition would be that in which the vaginal portion of the rupture runs diagonally to the patient's right; so that we may have, in addition to Group II., in which the laceration is left-lateral, a precisely similar injury in which it would be right-lateral. Lines *ab* and *bc*, Group I., describe the rupture of Group III.; line *bf*, Group I., describes the rupture of Group IV.

One may find, therefore, in the study of individual cases, by approximating the margins of the tear with tenacula, that the injury may correspond to any one or all of the lines in Group I., or to any combination of them. It may further show any variation in the length or regularity of these lines. It is a cardinal principle that, be these lines ever so variable in length and regularity, they can always be referred to the typical lines shown in Diagram 4, Group I.

The letters which have been used to designate the different points in each cut have, for purposes of convenience, been made to correspond one for all. For example, point *b* in Diagram 3, Group III., occupies the same relative position as point *b* in the two previous figures.

It is important to appreciate the mechanism of the injury as indicated by the arrow-heads in Diagram 4 of each group. They show the direction in which the torn fragments retract to make the broken outline indicated by Diagram 1 of each group.

The upper, branching portion of the Y-shaped tear indicates extensive injury to the perineal muscles and fasciæ, and requires deep denudation and deep suture to catch the impaired structures.

Preparatory Treatment.

The preparatory treatment consists of movement of the bowels and sterilization of the field of operation. The silkworm-gut suture is incomparably preferable to all others, and should be introduced under constant irrigation of hot, sterilized water.

Technique of Operation.

In the primary operation it is sometimes necessary to trim off the ragged edges of the wound before introducing the sutures. The secondary operation is substantially like the primary, except that, before adjusting the sutures, the surfaces must be properly denuded. Correct denudation is essential, and this is possible only when the lines of rupture are known. When healing has been by granulation after an unsuccessful primary operation or after no operation at all, the cicatricial lines will furnish a useful though not always accurate guide to the directions of the original tear.

The most reliable guide to the surfaces which are to be united is furnished, as in the primary operation, by means of tenacula, the use of which may be explained as follows:

When labor has not resulted in laceration, the vaginal outlet will be surrounded by the remains of the hymen, which mark off the vulva from the vagina—that is, by the carunculæ myrtiformes. These consist of numerous small protuberances situated near together and surrounding the vulva, as it were, like a string of beads. They are sometimes so close together and pronounced as almost to constitute an annular hymen.

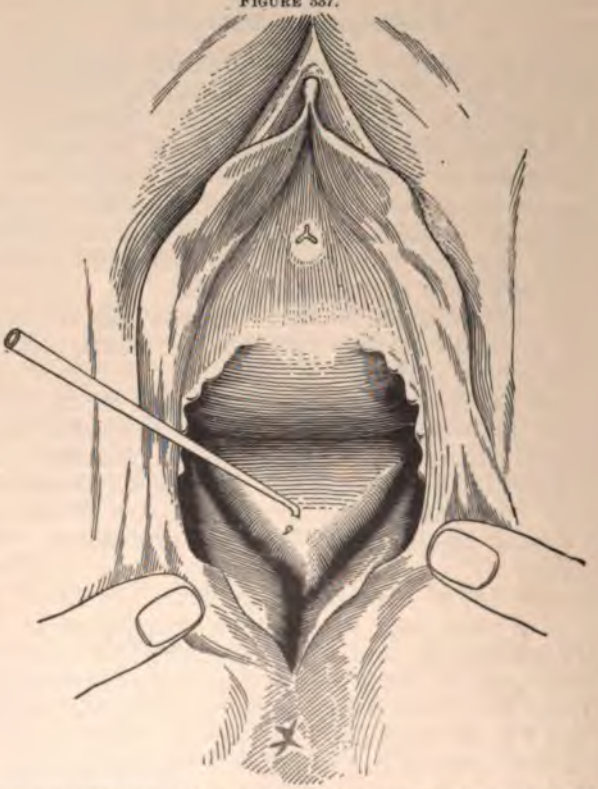
This circular line of carunculæ myrtiformes, in case of laceration, is broken at a point near the posterior commissure of the vulva. When this separation occurs the lowest caruncle on either side of the rupture is retracted to the corresponding side of the vaginal outlet. In the typical case, these two lowest caruncles will correspond to points *d* and *e* in the diagrams of Group I. Their location is also indicated in the corresponding points of Groups II. and IV. Figures 308 to 314 show the caruncles as they appear in the various stages of the operation. Group III., being a transverse laceration, does not involve the caruncles. The two lowest caruncles, on being approximated by the tenacula, show the surfaces to be united in the external parts of the rupture.

Then find some point near the centre of the upper fragment, point *b* (if a rectocele has formed, this will be its crest), and while the two

caruncles *d* and *e* are being held together, let point *b* be drawn into coincidence with points *d* and *e*. Then will the points *b*, *d*, and *e* come together and form one and the same point. The coincidence of these three points will show the surfaces which should be denuded and united upon themselves. See diagrams.

Remove the tenacula at *a*, *c*, and *d*; reintroduce one of them at *f*. Then consider tenacula *b*, *e*, and *f* as hooking up the three angles of a plane triangle. Let traction on the angles of this triangle be made by these tenacula in the hands of assistants, the direction of the traction being from the centre of the triangle toward each angle. The surfaces now put upon the stretch should be denuded. Then remove the tenaculum at point *e*, reintroduce it at point *d*, place the included triangle *bdf* upon the stretch, and denude as before. This completes the denudation.

FIGURE 337.

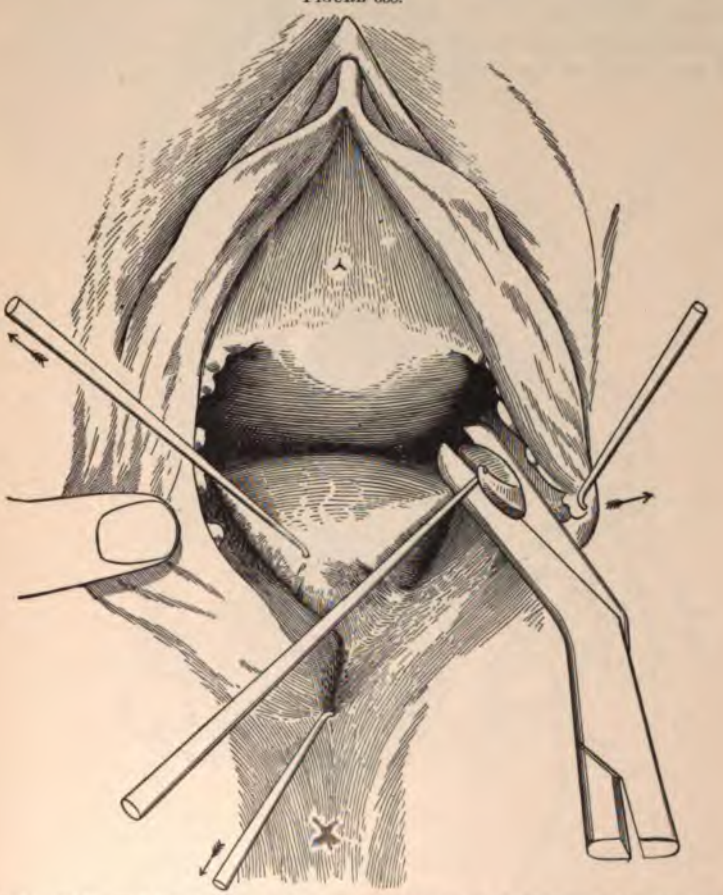


Typical incomplete laceration of the perineum; the tenaculum hooked into the crest of the rectocele (point *b* of the diagrams) draws it slightly forward and to the patient's right. The lacerations extend far into the two lateral sulci, and from there outward over the fourchette toward the anus.

Then remove the tenaculum at point *f* and reintroduce it at point *c*, making traction, and at the same time approximating points *b* and *e* with other tenacula.

Then the surface *bce* is to be united upon itself with a line of sutures so as to bring the line *bc* in coincidence with the line *ce*. In like manner line *ba* must be brought into coincidence with line *ad*. Finally, other sutures close the external rent, *def*, upon itself. Observe the suture whose entrance and exit are at points *e* and *d*, which makes a circuit around point *b*. This suture, which is the

FIGURE 338.



Parts made tense, and thereby exposed for denudation by three tenacula; traction made in direction of arrows by one tenaculum on crest of rectocele, by one on lowest left caruncle, and by one at the outer angle of the tear. These tenacula lift up and render accessible for denudation the torn sulcus on the left side; denudation with Emmet's slightly curved scissors, beginning just inside of the lowest left caruncle. Observe the first point of denuded surface between the scissors and the lowest left caruncle.

"crown stitch" of Emmet, brings points *b*, *d*, and *e* into coincidence. (See Diagram 4, Groups I. and IV.; and Figures 340 and 341.)

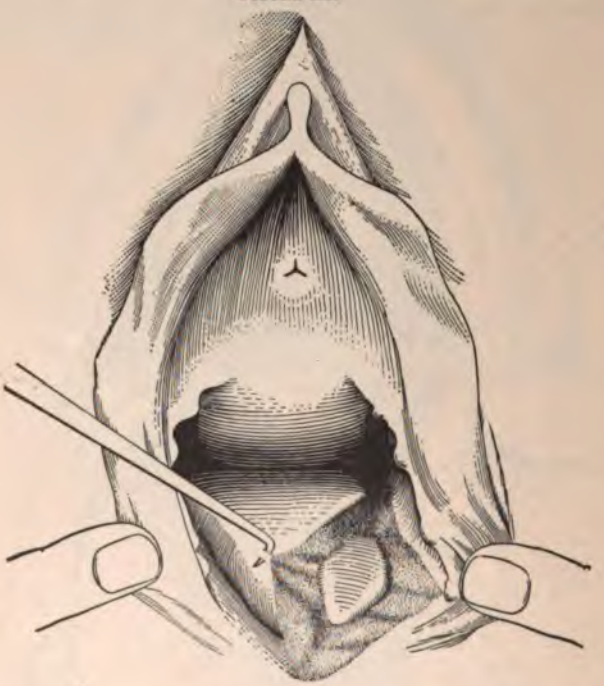
In the introduction of sutures one of the greatest principles of plastic surgery should be observed, namely, that freedom from wound-disease and consequent union require the sutures from their

points of entrance to their points of exit to be completely buried, so that they shall not anywhere appear in the exposed surfaces.

For the past ten years[1] I have introduced each suture and tied it before introducing the next, instead of first introducing all the sutures and tying them afterward, as is usually done. One reason for this is that the sutures are less likely under the former method to antagonize one another.

In a typical laceration (Group I., Diagram 3) let the first suture be introduced and tied in the angle or sulcus on one side, point *c*. The free ends should not be immediately cut short, but left long and given into the hand of an assistant, who should make firm traction upon

FIGURE 339.



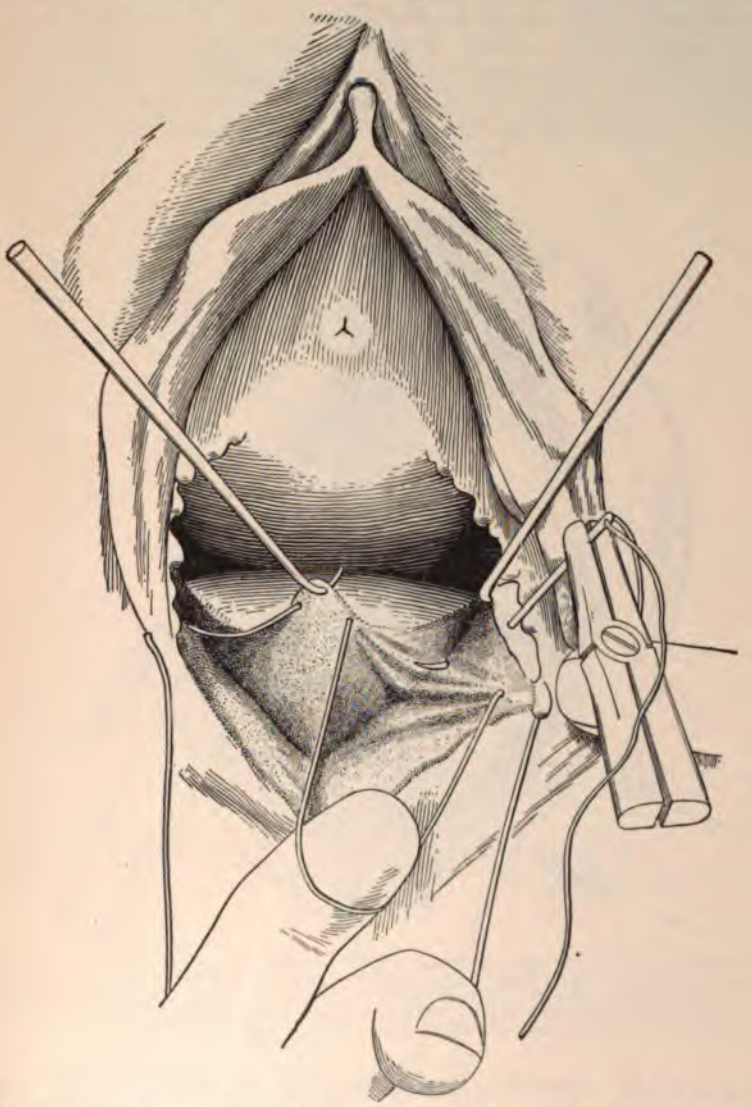
Denudation has been carried round the quadrangle on the left side. There remains an island of undenuded surface in the centre. This is easily caught up by means of the tenaculum and denuded with Emmet's scissors, or may be pushed forward by the index finger in the rectum, and removed with the flat of the scissors. The denudation is completed by the removal of the skin over a similar area on the right side. All small bleeding points are secured by torsion, larger ones by fine buried catgut ligatures.

them in the upward direction toward the pubes while the next suture is being placed and tied, when the long ends of this suture are also given, with the preceding one, into the hand of the same assistant. Then introduce the third suture, while firm traction is being made on the first two, precisely as the second was introduced, and so on until

[1] See Transactions American Gynecological Society.

the required number has been inserted and tied on that side. Repeat this on the opposite side.

FIGURE 340.

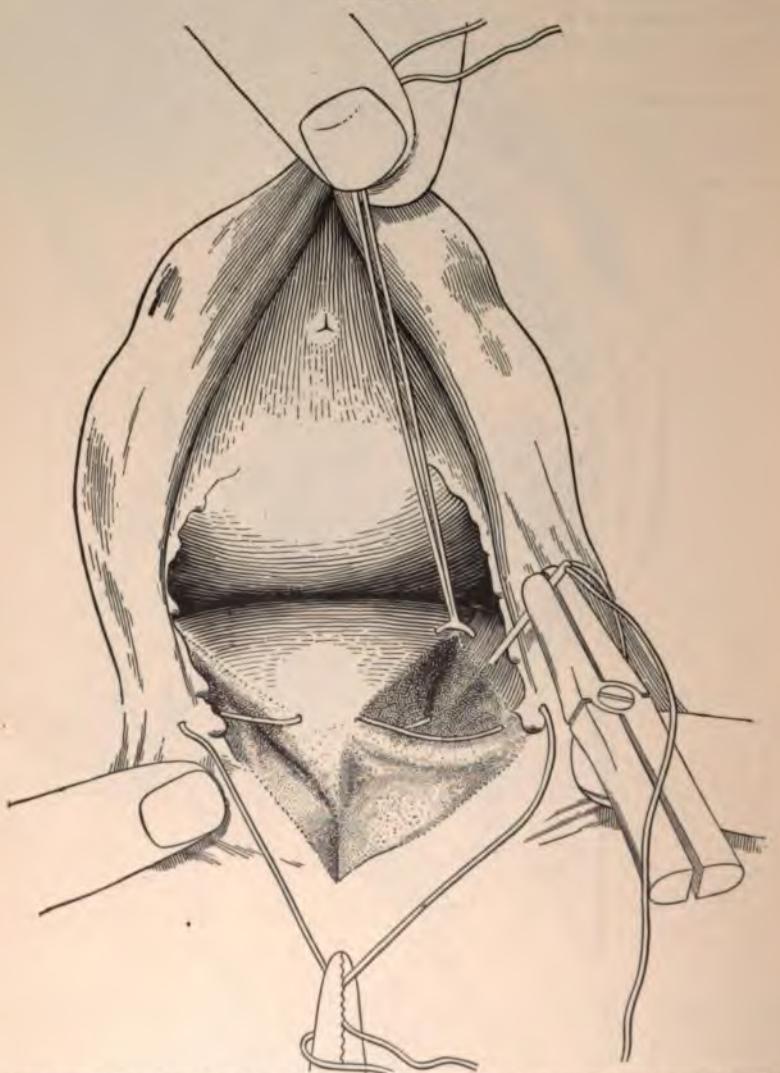


The crown suture, so called, in place. This suture catches up rather deeply the three principal landmarks of the operation, viz., the two lowest caruncles and the crest of the rectocele, and when finally tied brings them together, one tenaculum at the crest of the rectocele and the other at the inner angle of the left sulcus, and the finger at the left caruncle holds apart the denuded surfaces as they are being united on the left side. The operator's right index finger holds the crown stitch out of the way while with his right hand he introduces the first suture. The needle enters as is shown in the diagram, and will emerge at an angle to its present direction at the corresponding point opposite.

Then introduce a suture under the lowest caruncle on the left side, through the crest of the rectocele, or the centre of the upper frag-

ment, carrying the suture around, buried all the way, out through the lowest caruncle on the opposite side. This is parallel to and

FIGURE 341.



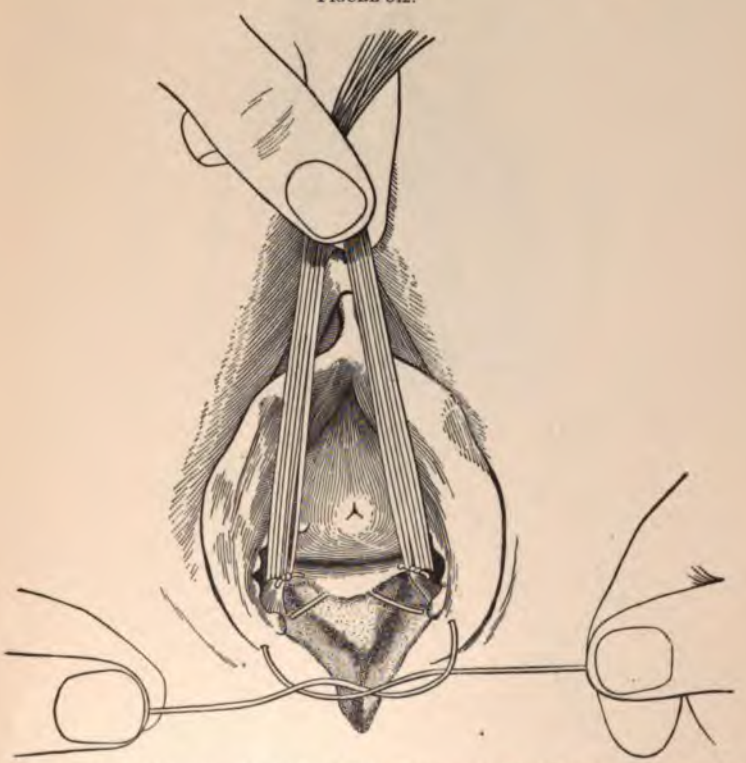
One suture passed and tied. While the second suture is being passed strong upward traction is being made on the first. Throughout the passage and tying of all sutures this firm traction is always made upon those previously tied, especially the one just preceding the one being introduced. The effects of this is to keep the perineum well lifted toward the pubes; if so lifted during the progress of the operation, it will maintain its normal position under the pubes, and after the operation will thus fulfil its functions as a support for the pelvic floor.

supplements the crown suture already mentioned and aids it in holding the three points, *b*, *d*, and *e* together. The vaginal portion of the operation is now complete. Figure 335.

The external or vulvar portion is closed in the same way—that is, while each suture is being introduced and tied, firm traction should be made upward, in the direction of the pubes, on the preceding sutures.

If the perineum be closed in this way, it is surprising to see how it will be brought up so as fairly to hug the pubes. Indeed, the posterior part of the vaginal outlet will almost exert pressure upon the neck of the bladder and pubes. By this method the operator should never fail to get the perineum into its normal position and location.

FIGURE 342.



The sutures in the two lateral sulci have all been passed and tied in the manner indicated in the two preceding figures; their free ends, as before, are being strongly pulled upward by the nurse while the operator is tying the crown stitch. This stitch when tied will bring the two lowest caruncles and the crest of the rectocele together, and will complete the introvaginal part of the operation. All sutures are introduced and tied under a constant stream of hot sterilized water.

Material for Sutures. Silkworm gut is preferred. The free ends of the sutures are left long. Numerous devices have been used by many operators so to dispose of these ends as to prevent them from irritating the patient. Emmet ties them in a fan-shaped bundle and leaves them between the thighs; others cut them short. The irritation and suffering from this source are so extreme that some operators have used sutures of softer material, such as silk or catgut; but such material is objectionable because the sutures absorb the wound-secretions, which secretions may decompose and produce suppuration.

I have for several years used a device which entirely obviates this difficulty. All the sutures are left long enough so that they may be laid down upon the vaginal surface and directed toward the upper

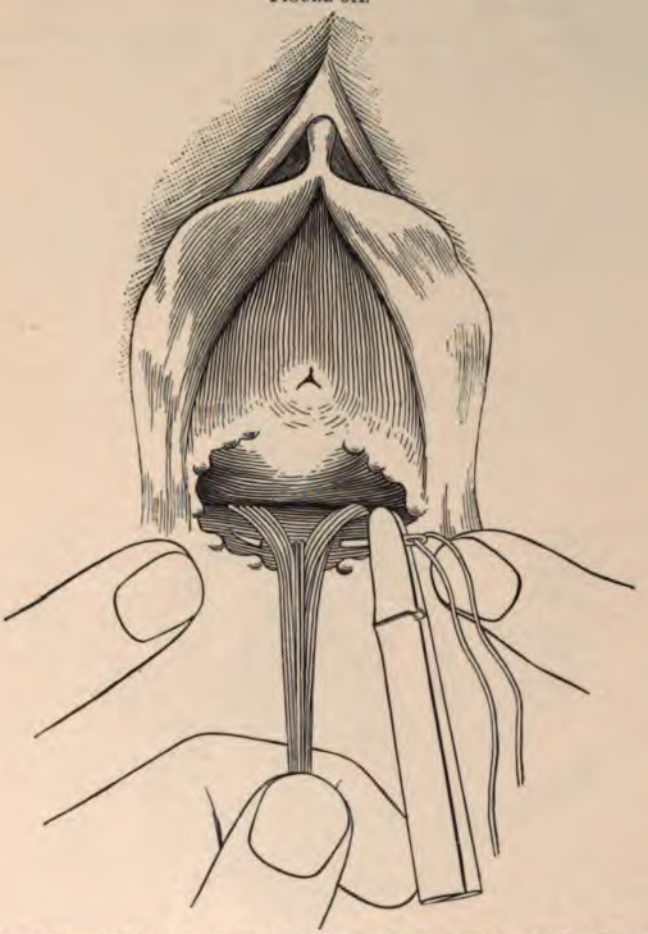
FIGURE 343.

While the nurse continues to make strong traction on the sutures, the operator is introducing the first suture for the repair of the extravaginal part of the injury. Observe the action of the tenaculum in making counter-pressure as the needle is passed through. Notice also that the needle is shown at the bottom of the wound. The general rule in plastic surgery, to bury the suture completely under the wound, although favorable to union, is disregarded in the passage of these outside sutures, for if so buried they would include and draw forward into the restored perineal body the crest of the rectocele. This rectocele is a portion of the recto-vaginal wall, and if not included in the sutures will take its normal place back of the restored perineum.

end of the vagina. The sutures are well turned into the vagina and held there by an additional or binding stitch which is tied over them and is situated just below the crown stitch. The free ends of this binding stitch are also bent inward in the direction of the long axis of the vagina. See Figures 344, 345, and 346.

A study of Groups II., III., and IV., Figures 335 and 336, will suffice to furnish a guide to the operation in atypical cases.

FIGURE 344.



The sutures intended for closure of the perineum having all been tied, are now temporarily held down and away from the vulva as shown in this figure. This is to facilitate the passage of a special suture just back of the crown suture. As soon as this special suture has been passed, and before it is tied, the bundle of sutures is returned to its former position as shown in the next figure. The purpose of the suture now being passed will become apparent in the next two figures.

After-treatment. The patient is not catheterized unless unable to pass urine. She is permitted to lie in any position. The conventional roll under the knees and bandaging of the thighs are unnecessary except for the comfort of the patient.

The external sutures should be removed in about ten days; the vaginal sutures in about sixteen. The removal of the latter is facilitated by the use of Sims' speculum reversed—that is, hooked under the pubes, the patient being on the back. During convalescence the patient may lie in any desired position. When on the back the legs

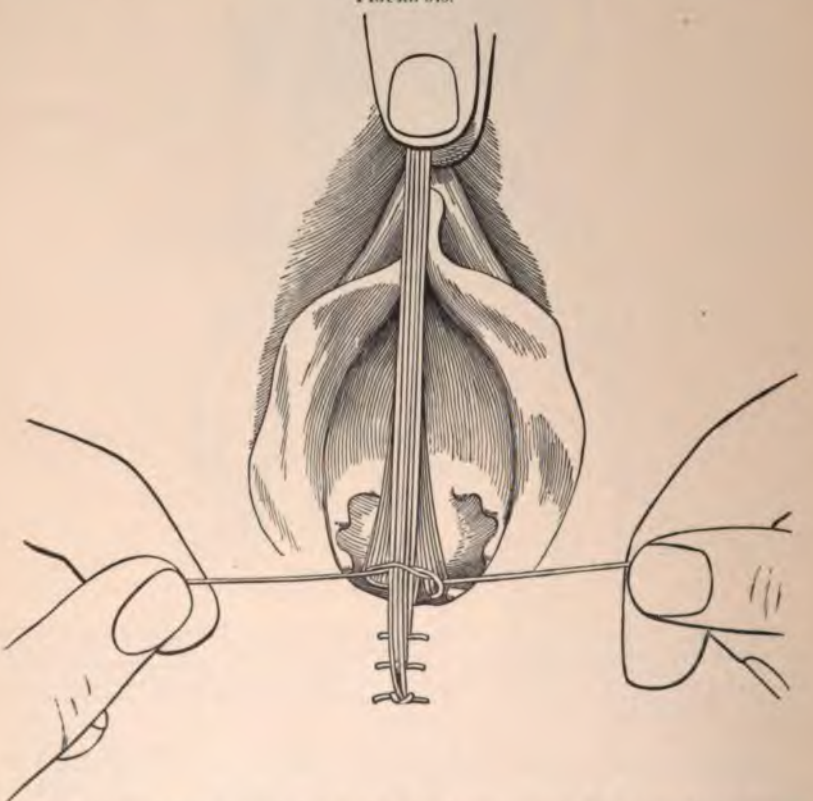
and thighs may be more comfortable if supported on a roll. A sterilized douche should be given every twelve hours, and the external parts showered off after urination or defecation. The wound is dressed antiseptically.

If secondary hemorrhage occur, the indication is for anæsthesia and prompt ligature of the bleeding point. For this purpose, the parts may be exposed by a speculum. Figure 346.

Other Operations.

The literature of the subject has been obscured by a countless variety of operations for the restoration of perineum. Every medical student is appalled by their number, their diversity, and their com-

FIGURE 345.



The special suture introduced in the last figure is now being tied; its purpose is to secure in a bundle the other sutures and hold them down against the posterior wall of the introitus vaginæ. The next figure will show all the sutures turned into the vagina. The special suture retains them there. The free ends of this retention-suture are carried with the others into the vagina.

plexity. It is hardly possible, however, that perineorrhaphy should furnish an exception to the great general principle, that progress in any direction is always characterized by simplicity.

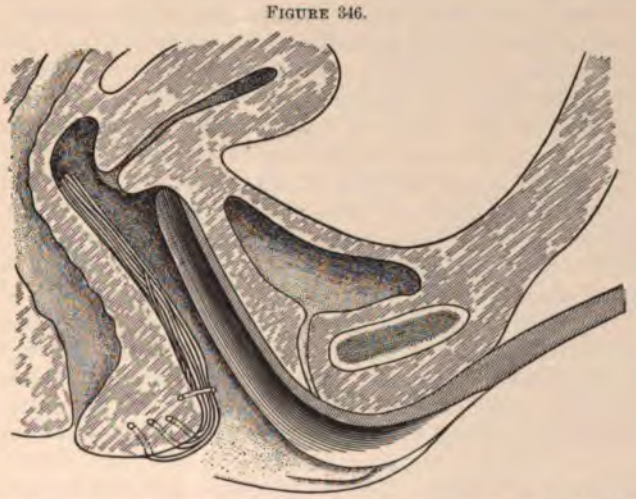
The object of perineorrhaphy is to replace rather than to enlarge the perineum. Many of the popular stereotyped operations which enlarge it really exaggerate the displacement.

The surgeon is often asked what operation he performs on the perineum. This implies that there is some fixed operation which is universally applicable. It would be no less absurd to ask what plastic operation is universally applicable to lacerated wounds of the face. It is not enough for an operator merely to get union at any cost, even though that union result in placing a solid mass of flesh where the perineum ought to be. Great harm comes if the parts brought into opposition are not parts which belong together.

Most of the stereotyped operations are prized because they make the "large, solid, perineal body," but such a perineum, composed of the union of parts which do not belong together, may be unfit for the performance of its functions, and may be very prone to subsequent rupture.

We hear much said about various stereotyped operations, the aim of which is to make a "large, solid, perineal body," a so-called "improvement on nature." This involves a radical and dangerous

FIGURE 346.



This sectional view of the sutures in position and tied completes the series of illustrations of the secondary operation for incomplete laceration of the perineum. The entire bundle of sutures is shown turned into the vagina, where they cannot irritate the wound. This arrangement permits adequate dressings over the external part of the wound and does away with the irritating and distressing ends of the sutures which are commonly left in contact with the external surfaces, and which always contribute enormously to the discomfort and pain of convalescence. A section of Sims' speculum is here shown. The instrument introduced in this way—*i. e.*, hooked under the pubis, with the patient in the dorsal position—facilitates the turning in of the sutures at the close of the operation, and may be again used in their removal at the end of about two weeks.

misconception. The large perineal body is contrary to nature, is unnecessary, is a disadvantage. The question is not of size, but of location. If the perineum, be it ever so small, is well up under the pubes, its location at that point indicates that the muscles and fascia of the pelvic floor are performing their function of supporting the

pelvic organs. Let us have an end of the fallacy that the perineum supports the organs because it is large, or, for that matter, in a certain sense, that it supports them at all. By its location and integrity it only contributes to their support as an essential part of the pelvic floor. In its normal location and integrity it indicates that the pelvic floor is giving support to the pelvic organs, is doing its part in the prevention of prolapse, is fulfilling its functions. A torn perineum properly situated may be adequate. An enormous perineum, if displaced toward the coccyx, may require operative treatment.

When a thoroughly scientific and satisfactory treatise is written on the subject of perineorrhaphy, it will not be an article describing the numerous and complicated operations. It will treat, in a general way, of operating in such a manner as to restore the parts to the condition in which they were before they were torn. The first step must be to find the landmarks, and Emmet has told us how to do this by bringing together the lowest carunculæ myrtiformes on either side with tenacula; when this has been done one may discern the directions of the original rent and the cicatrices. On the correct observation of these landmarks will depend the method by which we must proceed to restore the perineal body so as to leave the vaginal outlet with an annular arrangement of the remains of the hymen. Failure to study these cases with the remains of the hymen as a guide accounts for the numerous and divergent methods of perineorrhaphy.

The greatest lesson in perineorrhaphy is to apply the elementary principle that, in the repair of a wound, the essential purpose is to restore the wounded part to its original state. Always individualize each case, find out the lines of tear, their direction, their length, and then put the fragments back where they were before. He who does this will do a different operation in every case, but he will do one man's operation—the man will be himself. If one of the stereotyped operations in an individual produces a perfect result, it will be not because it has anything like universal adaptation to the repair of an injured perineum, but because it chanced to fit that case.

The flap-splitting operation, for example, usually results in the union of parts which were not together before the rupture, and perchance cannot be united without detriment to the patient; it is often performed with little judgment, and since it is so easy that a tyro can do it, has become popular. The principle of flap-splitting, however, as applied to perineorrhaphy, has great value in so far as it may enable the operator, in some cases, to readjust the fragments to their original relations. If used with skill and judgment, in some cases of deep injury to the fascia it serves a most useful purpose. Its broad application beyond this has done great and irreparable harm.

The buried suture in perineorrhaphy would be beyond criticism if its use were not occasionally followed by infection. Numerous operations in the hands of careful aseptic surgeons have resulted in suppuration, burrowing of pus, formation of recto-vaginal and recto-perineal fistulæ, and dangerous sepsis. The advantages of the buried over the ordinary interrupted suture which is tied on the surface do not outweigh this danger.

In cases of extreme cystocele and rectocele it is often necessary, especially in women who have passed the menopause, to combine with closure of the perineum the removal of a portion of the vaginal plate of the vesico-vaginal and recto-vaginal walls—an elliptical piece from the anterior vaginal wall, and a triangular piece, with the apex toward the uterus, from the posterior vaginal wall. The margins of the vaginal wounds thus made should be united from side to side by interrupted sutures. The purse-string suture of Stoltz should never be used because it tends to shorten the vagina and thus to displace the uterus.

Complete Perineorrhaphy.

Perineorrhaphy involving the sphincter ani muscle differs in some details from the operation just described: first, in the preparatory treatment; second, in the denudation; third, in the passage of the sutures; fourth, in the after-treatment.

Preparatory Treatment. The chances for union of the wound are increased by limiting the amount of feces passed over it during the first days following the operation; hence the bowels should be as nearly empty and aseptic as practicable. With this object they should be treated as in the preparation for major operation, Chapter VI.

Denudation. Figure 347 shows the rent extending up into the recto-vaginal septum. At points *m* and *m* are two pits or depressions caused by the retraction of the ends of the sphincter ani muscle. The principal object of the operation is the union of these ends and the consequent restoration of the sphincteric function. The denudation must, therefore, include the pits or depressions. They may be seen, though not always without careful search, at either side of the anus, The denudation starts just below the pit on the patient's left, and is carried around on the margin of the torn recto-vaginal septum to include the opposite pit.

A common fault in denudation is not to include these torn ends of the sphincter. Observe carefully that they are situated well down on a level with the posterior margin of the anus. Failure to carry the denudation well below them would clearly defeat the object of the suture. The remaining denudation is then done as for an incomplete rupture.

Passing of the Sutures. The sutures should be of silkworm gut. The first two or three should be introduced to the left of the anus, should pass somewhat deeply under the left pit, as shown in Figure 348, should sweep around under the border of the torn septum, and pass under the opposite pit and emerge to the right of the anus. Figure 349 shows the ends of the sphincter united by the three lower sutures. The problem is now simplified to that of an incomplete operation, and the remaining sutures are placed as already described for closure of an incomplete laceration. The sutures, having been tied, are all turned into the vagina, as shown in Figure 346, and the vulva is protected by an aseptic gauze dressing.

After-treatment. A full cathartic of castor oil or compound licorice powder should be given on the third day, and repeated, if nec-

essary, to secure a free action. Excessive catharsis, producing frequently repeated liquid stools, might set up irritation of the anus sufficient to prevent healing, and should therefore be arrested by the use of opium or morphine. After the first movement of the bowels

FIGURE 347.

FIGURE 348.

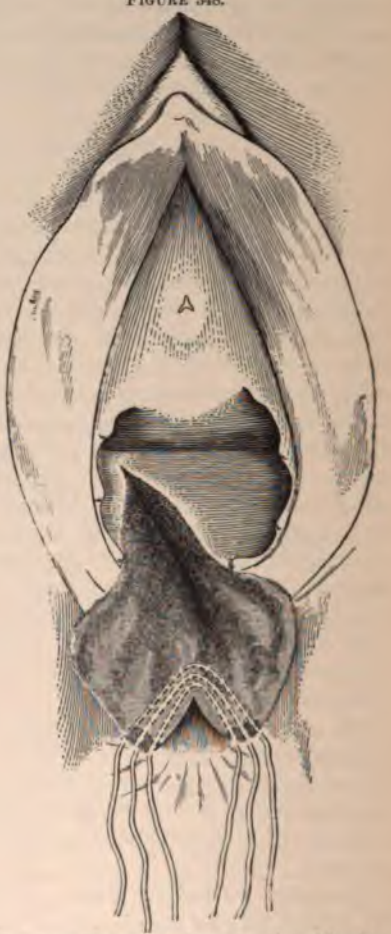


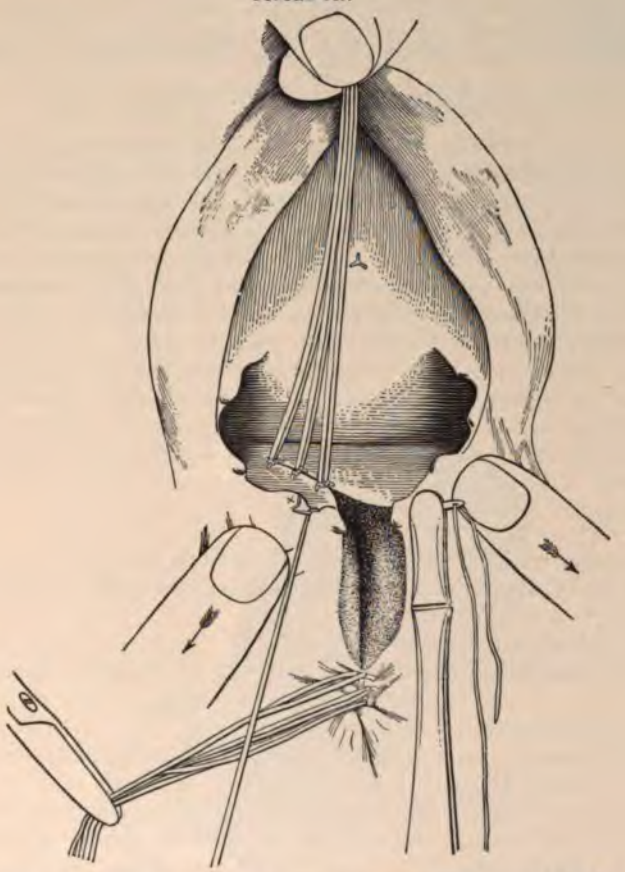
Figure 347.—Faulty method of passing the anal sutures. Interrupted sutures placed in this manner and tied on the anal side of the wound are open to the following objections: 1. They make a long line of union which is exposed to the hostile environment of the bowel. 2. The knots and free ends of the suture in the bowel may take up septic secretions and carry them by capillary attraction to the deeper parts of the wound, and in this way cause infection and failure of union. 3. A long line of union is difficult to protect against infection.

Figure 348.—The purse-string method of suture. This draws the wound into a small compass; it leaves no part of a suture in the bowel to absorb and carry septic secretions; the inner angle of the anal portion of the wound is drawn down to the margin of the anus, where it is less liable to infection than if the wound were longer and exposed to the interior of the bowel. Experience has shown that this method of suture is immeasurably more successful in securing primary union than that shown in Figure 316.

the stools should be kept semi-fluid. This may require a cathartic at intervals of not more than two days. During the first week, whenever the bowels are about to move, it is well to give a rectal enema of eight ounces of olive oil. In giving the enema the syringe-tip should be

carefully passed along the posterior wall of the anus away from the anal sutures. Carelessness at this point may break open the newly united surfaces and destroy the result.

FIGURE 349.



This represents the repair of a complete perineal laceration extending a short distance into the right lateral sulcus of the vagina. The three sutures which reunite the ends of the sphincter ani muscle are tied and held to one side by the forceps. Vaginal sulcus closed with three stitches, which are tied and held up by the assistant. The needle is being introduced for the passage of the crown stitch which unites the lowest caruncles. There is no rectocele in complete lacerations; hence the crown stitch does not include it. The remaining sutures to be passed will close the external part of the wound. Observe that the folds about the restored anus radiate in all directions instead of downward, as in the previous figures. This is a reliable indication of the adequacy of the anal sutures. The fingers hold the vulva open and expose the intravaginal sutures, which would otherwise be out of sight.

If there is no suppuration, the sutures should not be removed until about the fourteenth day. In other respects the after-treatment is the same as for incomplete laceration.

CHAPTER XLII.

PUERPERAL LACERATION OF THE CERVIX UTERI.

Literary History and Priority.

THE credit of having established the pathological significance and surgical treatment of laceration of the cervix uteri belongs to Emmet. His three original communications[1] not only contained the first practical information on the subject, but, what is more remarkable when we consider the great frequency and the far-reaching pathological results of the lesion, the information which they contained was at once so complete, so accurate, and so adequate that little if anything of importance has since been added.

Vague allusions to the subject had from time to time appeared before the publication of Emmet's papers, but only to record the fact that such an injury could result from parturition. They contained little account of its pathological significance and none of its surgical treatment.[2]

Causes.

The causes of laceration of the cervix uteri are these:

1. Relative disproportion in size between the child and the cervix.
2. Rigidity of the cervix.
3. Rapid second stage.
4. Any disease of the cervix which causes friability impairs elasticity.
5. Instrumentation.
6. Meddlesome manipulation, such as manual dilatation of the cervix to hasten labor.

The cervix is not fully prepared for dilatation and the transmission of the child until the end of the normal period of gestation; hence the greater liability to injury in premature and immature labor. Abortion in the earlier months of pregnancy is not a frequent cause of laceration, except as it may result from forcible dilatation. A greatly prolonged labor may, by continued pressure, induce nutritive changes, and thereby decrease the elasticity and increase the liability to rupture. This condition is an approach to pressure necrosis.

Pathological Anatomy and Results.

At the outset, let the important fact be clearly kept in mind that the injury is usually more extensive in the surrounding vaginal struct-

[1] Surgery of the Cervix Uteri. American Journal of Obstetrics, February, 1869. Laceration of the Cervix Uteri as a Frequent and Unrecognized Cause of Disease. Ibid., Nov., 1874. The Proper Treatment of Lacerations of the Cervix Uteri. American Practitioner, January, 1877.

[2] The Causes and Treatment of Sterility. Gardener, 1856. Cicatricial Ectropion of the Cervix. W. Roser. Archiv für Heilkunde, ii. S. 97, 1861.

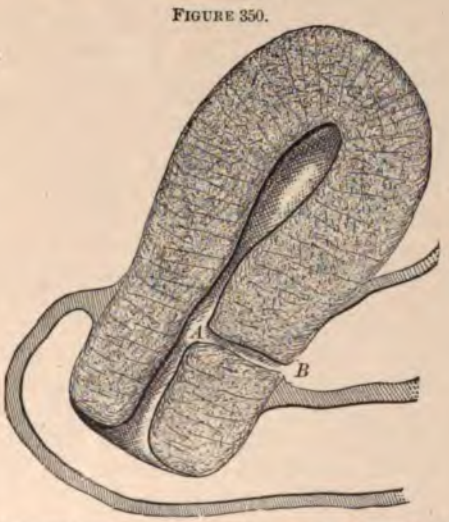
ures than in the cervix proper. This is, perhaps, contrary to the usual notion; but an examination of what follows on the state of the cervix before, during, and after labor, and the careful diagnostic study of cases will demonstrate this fact.

The diameter of the cervical canal in the non-pregnant uterus is about one-fifth of an inch. This must be increased at delivery to correspond to the diameter of the child's head; it is, therefore, not surprising that some degree of laceration occurs in the majority of labors. The lesion, however, is generally slight, and heals so readily and rapidly as to cause little or no pathological result.

The Directions and Extent of cervical laceration vary within the widest limits—*i. e.*, the cervix may tear in any direction and to any extent. The usual directions are: anterior, posterior, and lateral.

Anterior and posterior lacerations, especially the former, usually heal spontaneously, and are, therefore, seldom clinically observed. This healing is explained by the anatomical arrangement of the vaginal walls, which tends to keep the torn fragments in close contact while union is taking place.

FIGURE 350.



Vesico-uterine fistula at angle of laceration. Fistulous tract after partial healing of an anterior laceration.[1]

Anterior laceration in rare instances may extend so far as to invade the bladder and make a vesico-utero-vaginal fistula. In such a case, if attention be paid to cleanliness, considerable spontaneous healing usually follows. There may be left, however, a small vesico-vaginal fistula at the utero-vaginal attachments, or a vesico-uterine fistula at the angle of the laceration, extending from this part of the cervical canal into the bladder.

Posterior lacerations, extending into the posterior vaginal pouch, may open the door for post-uterine infection, and thus give rise to

[1] After Emmet. Principles and Practice of Gynecology.

contracting cicatricial bands; these may draw the uterus downward and backward, and fix it in an intractable retroversion or retroflexion. A variety of distressing and disabling functional disturbances, including menstrual disorders, sterility, and extension of the infection to the parametria and the peritoneum, are among the least serious results which may be expected from this condition.

Lateral lacerations occur most frequently to the left, less frequently to the right and left, least frequently to the right of the cervix.

The False Cervix. Nature, instead of repairing the injury of a lateral laceration, resorts to a deception so artful that, until exposed by Emmet, the lesion had been practically an unknown factor in uterine pathology. By this deception a false cervix, composed chiefly of out-rolled intra-uterine and reduplicated vaginal tissue, is substituted for the normal cervix. The evidence of laceration—that is, the irregular, fissured, uneven appearance—is so obliterated that even the practised eye may fail to recognize it. If diagnosis between the normal and the lacerated cervix were solely dependent on sight, cases would commonly arise in which increased size, congestion, and erosion would be the only diagnostic signs.

The condition of the cervix before, during, and after labor, as laid down in the following statement,[1] has a determining influence upon the immediate mechanical results of laceration.

Before labor, from the moment of the pregnancy, the cervix, as well as the body of the uterus, enlarges to accommodate the growing fœtus. From the first, the entire cervix, except a small part which surrounds the external os, expands symmetrically with the body above. This expansion early in pregnancy obliterates the internal os, and converts the entire cervix into an inverted dome, which projects into the vagina, and whose walls are continuous with those of the corpus. Thus, long before term, a very large part of the fœtal covering is composed of evolved and expanded cervical tissue.

During labor there will be some plane in the cervix above which the muscular wall of the uterus contracts, and below which it dilates, for the expulsion of the child. Examination after delivery shows a hard, contracted, unyielding ring. This has sometimes appeared to the examiner to be the contracted external os. It is, however, above the plane of the external os, perhaps even above the utero-vaginal attachment. The plates of Braune, drawn from frozen sections of the gravid uterus, show the remnants of the internal os to be on a plane far above this contracted ring. It is, therefore, neither the contracted internal nor the external os, but is situated between the two, and is the lowest margin of the contracted part of the uterine wall. It is a temporary intracervical os, below which one must look for that part of the cervix which during labor was compelled to undergo excessive dilatation; and one must expect there to find laceration if it be present.

Without care this lowest part of the cervix, which has been so stretched that it cannot immediately recover its contractile power, will be entirely overlooked. It can, however, always be felt project-

[1] John Bartlett. Chicago Medical Journal, October, 1873. Wilhelm Braune. Atlas of Topographical Anatomy, Leipsic. Translation. Philadelphia, 1877.

ing into the vagina as a "flabby, floating collar," not unlike a "section of large intestine," and has even less contractile power than the sphincter ani muscle after extreme forcible dilatation by the method of Van Buren.

After normal labor this lowest portion of the cervix slowly recovers its contractile power, and in a few days resumes its normal shape, and the external os is thereby restored.

If bilateral laceration occur, nature has all the conditions for the formation of the false cervix already mentioned. The anterior and posterior diverging flaps are at once forced in the directions of the least resistance: the former forward toward the vaginal outlet, the latter backward into the posterior vaginal fornix. The congested tissues about the temporary os, which in the foregoing paragraph have been called intracervical, meeting no resistance, now roll out. This eversion gives rise to obstruction in the uterine circulation. The intracervical structures, thus engorged and swollen, no longer have sufficient space for their accommodation within the uterus; hence the eversion continues until tissue enough for the formation of the false cervix has been rolled out into the vagina, and until the temporary intracervical os may actually have usurped the place of the now destroyed os externum. This everted intracervical mucosa, now rolled out into hostile surroundings, becomes infected, and the infection may extend along the mucosa to the endometrium, Fallopian tubes, peritoneum, and ovaries; or by continuity of the deeper tissues to the myometrium, perimetrium, or parametrium. Laceration of the cervix, therefore, supplemented by infection, may open the door to extensive pelvic disease.

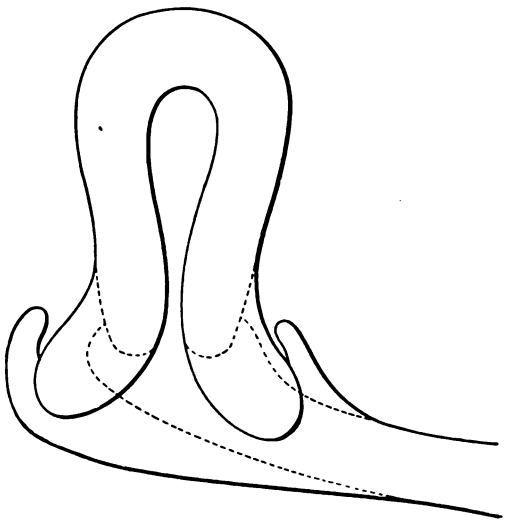
Subinvolution. The physiological hypertrophy of pregnancy, which ought to subside after labor, may, under the influence of infection, fail to do so, and become pathological. Hence the uterus remains enlarged; this enlargement, called subinvolution, is a very common result of laceration. It usually pertains more to the cervix than to the corpus uteri. See Chapter XVIII.

Descent and Vaginal Reduplication. When the patient assumes the upright position the supports of the heavy congested subinvoluted uterus are inadequate to hold it on the health level; it settles by its own weight to a lower level and carries with it a reflected fold of the vaginal wall. See Figure 355. The vaginal portion of the cervix is thus made apparently much longer than it really is. The soft, easily-moulded, out-rolled intra-uterine tissue and the reflected vaginal walls may completely obliterate the fissure which is commonly regarded as the evidence of laceration; upon ordinary examination, therefore, the tear may be entirely overlooked. The deception may be exposed by placing the patient in the knee-breast position. The uterus, by its own weight, will then be carried toward the diaphragm; the vaginal wall will unfold and disclose the true utero-vaginal attachment; and not uncommonly a deep laceration may be seen extending on either side far into the vaginal walls.

When the laceration is confined to one side the deception is even greater, for, as shown by Emmet, the fundus in such cases is usually

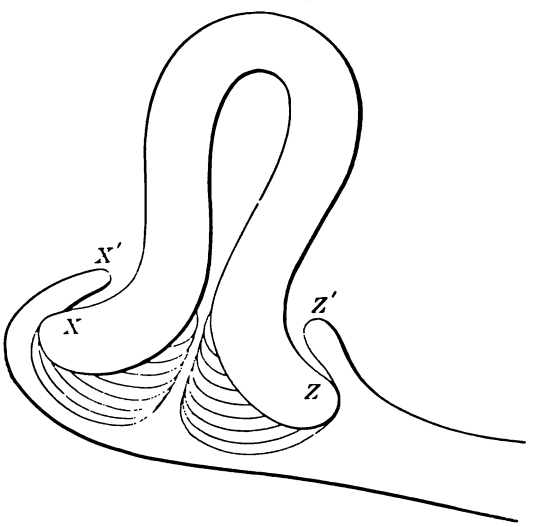
drawn toward the affected side by inflammatory contraction of the nearest broad ligament. The effect of this lateroversion is to raise the

FIGURE 351.



The widely separated lips of the recently lacerated cervix. The posterior lip is crowding backward into the posterior vaginal fornix, the anterior lip forward toward the vaginal outlet. The dotted lines show the contour of the uterus and the vagina before the laceration. The location of the temporary intracervical os is at the bottom or angle of the laceration.

FIGURE 352.

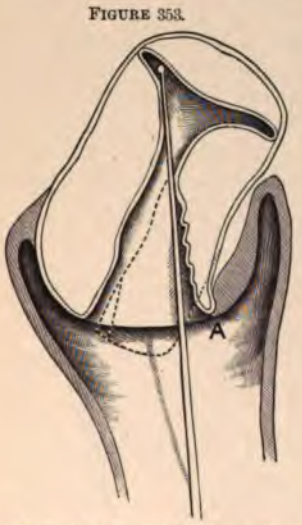


Shows the circular enlargement of the cervix due to out-rolling of the intracervical tissue, and the apparent elongation due to reduplication of the vaginal walls. The actual utero-vaginal attachment is at *X* and *Z*. The reduplication makes it appear to be at *X'* and *Z'*. See Figure 325.

uninjured side of the cervix a trifle higher in the pelvis, and correspondingly to depress the injured side, thereby causing a reflection

of the vaginal wall on the depressed side, so that, as in the bilateral injury, the apparent os externum may seem to be in the very centre of the cervix when it is really on one side. To add to the confusion, the sound, entering at the side, may, though passing to the horn of the opposite side of the uterus, appear to pass in the median line.

FIGURE 353.



False cervix in unilateral laceration. Obliquity of the uterine axis from contraction of broad ligament.[1]

FIGURE 354.

Double laceration, showing enlarged mucous follicles.[2]

Cystic Degeneration. Puerperal laceration of the cervix uteri causes marked out-rolling of intra-uterine tissue and consequent permanent, passive congestion. The delicate intra-uterine membrane, instead of being in contact with the mild alkaline secretion of the uterus to which it is accustomed, is in contact with the irritating acid secretion of the vagina. But the mischief does not end here. The uterine supports may soon prove quite unequal to the work of sustaining in position a uterus heavy from congestion, and it falls to a lower plane in the pelvis. The everted membrane, in contact with the posterior vaginal wall, and constantly bathed in the vaginal secretions, is subject, by reason of the normal movements of the uterus, to the additional irritation of friction. An erosion forms, and the mucous follicles, Nabothian glands, estimated by Tyler Smith[3] to number ten thousand in the normal virgin cervix, become diseased. Some of them pour out the familiar thick, colorless, viscid, ropy secretion. Others, in consequence of adhesive inflammation which has occluded their outlets, become distended by their own secretion and undergo cystic degeneration. These cysts are generally present, frequently in large numbers. Subinvolution, including enlargement of the bloodvessels, is a natural sequence of these changes.

[1] Emmet's Principles and Practice of Gynecology.

[2] Ibid.

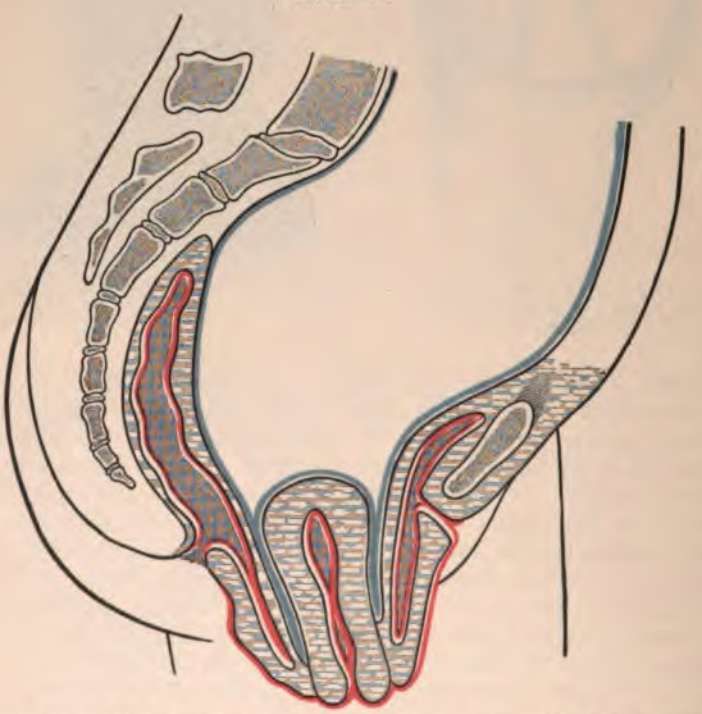
[3] On Leucorrhœa, American edition, p. 38.

Composition of the False Cervix. As already outlined, the false cervix is composed of:

Everted intra-uterine tissue.
Reflected vaginal wall.
Cervical follicles which have undergone cystic degeneration.
Congested and inflamed mucosa and submucosa.
Enlarged bloodvessels.

Apparent Hypertrophy and Elongation of the Cervix. Cases are frequent in which there is apparent lengthening of the cervix, so that it seems to extend from the utero-vaginal attachment even to the vulva; the condition is usually described as hypertrophic elongation of the cervix. Credit for the true explanation of this anomaly belongs to Emmet. Figure 355 shows the os externum outside the

FIGURE 355.



Extreme reflection of the vaginal walls over a prolapsed uterus, giving the false appearance of elongation of the cervix.

vulva. This is not because the infravaginal portion of the cervix has lengthened by hypertrophy so as to occupy the entire length of the vagina, but because the entire uterus has prolapsed until the os externum has appeared at the vulva. If the patient be placed in the knee-breast position and the uterus be made to gravitate toward the diaphragm, the reflected vagina will be unfolded, the cervix will resume its normal distance from the vulva, and the utero-

vaginal attachment will appear at the proper distance from the os externum—that is, the normal relations of the vagina and uterus will be restored.

Apparent elongation occasionally takes place in the nullipara, but it is more commonly associated with descent of the lacerated cervix. The extent of laceration will be apparent in proportion to the degree of eversion—that is, in some cases the evidence of laceration, as already explained, is obliterated by the out-rolled intra-uterine tissue; in other cases of less eversion the laceration is more apparent. A striking illustration of the latter class of cases is furnished by the following case:

The patient had been sent to the hospital for amputation of a supposed "hypertrophied cervix." Superficial examination suggested the presence of two large uterine polypi, one filling the anterior and

FIGURE 356.

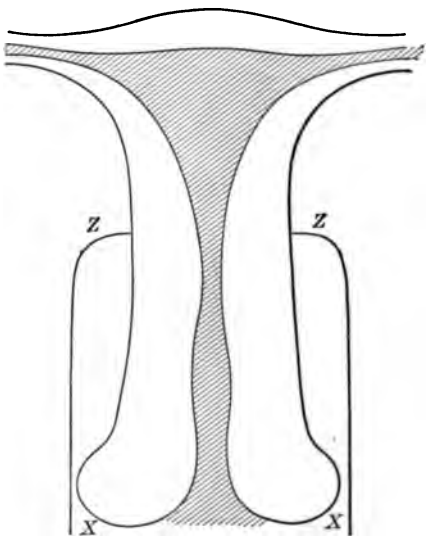


FIGURE 357.

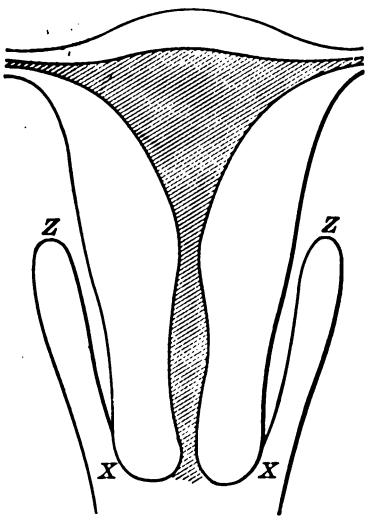


Figure 356.—This figure is from a part of an illustration in a standard book, in which it was used to represent supposed infravaginal hypertrophy of the cervix. The vaginal attachment, however, is only apparent, and is really due to reflection of the vaginal wall on a lacerated cervix. The true utero-vaginal attachment is shown at *X* and *X* of Figure 357. Figure 355 is a correct representation of the real condition.

Figure 357.—Shows the true utero-vaginal attachment at *X* and *X*, and the apparent utero-vaginal attachment at *Z* and *Z*.

the other the posterior half of the vagina, both reaching to the vulva; further examination disclosed the apparent presence of extreme hypertrophy of the anterior and posterior lips of the cervix. Between these two lips was a fissure extending into the vagina for at least two inches. When the patient was placed in the knee-breast position, however, the uterus gravitated toward the diaphragm; the utero-vaginal attachment appeared in its true relation, and it was plainly to be seen that, instead of hypertrophic elongation of the infra-vaginal portion of the cervix, some degree of atrophy had actually taken place, for the utero-vaginal attachment was nearer to the ex-

ternal os than normal. There was a fissure, disclosing an enormous bilateral laceration, which extended for two inches into a subinvoluted uterus and far out into the vaginal walls on either side. Repair of the cervix was promptly followed by the disappearance of all pseudo-elongation, both in the infravaginal and the supravaginal portions of the cervix, and in a few weeks by complete subsidence of subinvolution. In a similar case of unilateral laceration, with extreme eversion, the apparently elongated cervix showed no fissure, but, on the contrary, was symmetrical.

FIGURE 358.

Shows supravaginal elongation of the cervix. Post-mortem specimens frequently show elongation of the cervix which did not exist during life; hence the observation should always be made upon the living subject. Observe in this specimen the atrophic narrowing of the supravaginal portion. This condition, except as observed post-mortem, is uncommon.[1]

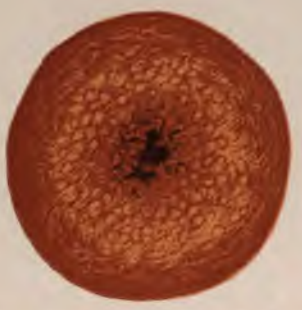
The explanation of apparent hypertrophic elongation and circular enlargement of the cervix need no longer rest upon the sole authority of Emmet; it has been abundantly verified by a large number of other competent observers. The subject will be further considered under Descent of the Uterus.

Amputation of the cervix and hysterectomy for so-called "hypertrophic elongation" and "hypertrophic enlargment of its circumference" are favorite operations in gynecology. The true pathology of this condition would, however, demand not amputation or hysterectomy, but closure of the cervix, if lacerated, and the appropriate treatment for displacement.

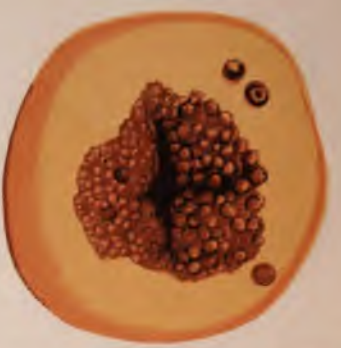
The existence of genuine hypertrophic enlargement and elongation

[1] After Courty, in Bonnet et Petit, Gynécologie.

PLATE XXI.



Granular Erosion of Cervix.



Cystic Degeneration after Laceration.

Deep Stellate Laceration.

Stellate Laceration with Ectropium and Cystic Disease.

Crescentic Laceration with Erosion of one Lip.

Deep Destructive Laceration up to Inner Os.

LACERATIONS OF CERVIX.[1]

[1] After Mundé, American Journal

PLATE XXII.

Unilateral Laceration beyond Vaginal Insertion.

Stellate Fissure with Erosion.

Double Laceration with Erosion.

Double Laceration beyond Vaginal Junction.

Bilateral Laceration, Great Erosion and Cicatricial Induration, Simulating Malignant Disease.

Cystic Disease Implanted Lacerated Cervix, Sil ing Epithelioma.

LAC OF CERVIX.[1]

[1] After rnal of Obstetrics, 1879.

of the cervix is not absolutely denied ; it is, however, of extremely rare occurrence—so rare that amputation of the cervix, except the removal of certain diseased portions, as will be explained in the operation for lacerated cervix, should become practically obsolete. In carcinoma of the cervix and in extreme inflammatory infection of the uterus, not amputation of the cervix, but hysterectomy is the operation of election.

When hypertrophic elongation of the cervix does exist, it is above the utero-vaginal attachments, and is therefore supravaginal. Infravaginal elongation of the cervix, which is below the utero-vaginal attachment, is often apparent, seldom or never real.

A Cause of Carcinoma. Emmet first observed the relatively more frequent development of cancer upon the lacerated cervix and the almost entire absence of it from the nulliparous cervix, and offers the following explanation : Benign adenoma is apparently a pathological connecting link between glandular endometritis and malignant adenoma. Malignant adenoma is cancer ; hence a possible pathological sequence from laceration of the cervix, and consequent cervicitis, to cancer. We may not, strictly speaking, attribute cancer to laceration of the cervix ; but we must not ignore the fact that glands of the lacerated cervix are a fruitful soil for malignant disease.

There are certain congenital and acquired conditions which closely simulate laceration of the cervix. Such conditions, especially when they occur in the virgin, should for obvious reasons be distinguished from puerperal laceration. They do not, as a rule, present cystic degeneration nor extreme cervical eversion.

Symptoms.

Immediately after the accident occurs, arterial hemorrhage may be so profuse as to demand prompt ligature and suture. The secondary symptoms are those of the pathological results of the lesion—that is, the symptoms of endometritis, metritis, subinvolution, and displacements. The menorrhagia and uterine discharges so common in laceration are the symptoms of hemorrhagic and catarrhal or purulent endometritis. A variety of nervous symptoms, such as may be due to faulty innervation and nutrition, have been attributed to laceration of the cervix. They include neuralgic and other pains in remote parts, dyspepsia, indigestion, constipation, menstrual disorders, backache, and headache. Bearing-down sensations and difficulty of walking and standing are among the results of the associated displacements of the pelvic floor. These displacements include the uterus, its appendages, the bladder, vagina, and rectum.

Cicatricial narrowing of the uterine canal at the angle of the laceration may be so extreme, either from natural contraction or from the use of caustics, as to reduce the uterine outlet to a mere pinpoint. This reduction of calibre results in imperfect drainage of uterine secretions. Endometritis and numerous functional disturbances, including sterility, dysmenorrhœa, menorrhagia, and amenorrhœa, are common sequels.

Emmet lays great stress upon the reflex irritation produced by the cicatricial plug in the angle of the laceration. The cicatrix develops

in an effort of nature to close the gap, or as a result of the injudicious application of caustics. He cites numerous cases in which excessive neuralgia in distant organs—for example, neuralgia in the eyeball—promptly disappeared upon repair of the laceration. He attributes the reflex irritation to the inclusion and pinching of nerve filaments in the cicatrix, as in the sensitive stump after amputation of the leg or arm. The cicatrix, therefore, may serve as a constant and hidden cause of nerve irritation. The anæmic, nervous, neuralgic state is peculiarly liable to be associated with cicatricial cervix. Whatever may be the explanation of the facts, the clinical observations of Emmet have been verified by numerous observers.

The brief report of two cases will serve to illustrate: A patient consulted one of the most distinguished ophthalmologists in America for a long-standing, severe, and obstinate neuralgia of the eyeball. As the only possible means of relief extirpation of the eye was finally advised; this operation the patient declined, and the pain continued. She was subsequently operated upon by Emmet for laceration. He removed a large, wedge-shaped piece of cicatricial tissue from the angle of laceration, which nature, in the vain attempt to bridge over the gap, had placed there. Immediate and permanent relief from the neuralgia followed.

In April, 1878, the writer performed a similar operation upon a woman who had for years suffered from almost constant pain in the top of the head. Up to the time of the operation every resource of treatment had failed. In this case the cervix was not eroded, but from the perseverance of some one in making caustic applications it had suffered considerable loss of substance. The indurated tissue was very abundant, so that in its thorough removal an unusual amount of cervix was sacrificed. The pain disappeared from the time of the operation and has not returned.

Clinical observation has shown sterility and repeated abortion to be very frequently associated with laceration of the cervix. The pathological results of laceration already detailed furnish a clear explanation of this fact.

Diagnosis.

Laceration of the cervix, until demonstrated by Emmet, was known only by its effects. To designate the extent and character of these effects, the following names were applied: *erosion*, *follicular erosion*, *granular erosion*, *papillary erosion*, *granulation*, *excoriation*, *ulcer*. Erosions, when exaggerated, were called *coxcomb granulations;* when the exaggeration was so extreme as to suggest malignant disease, it was sometimes called *cauliflower excrescence*, a name loosely used also in cancer. Inflammation of the cervical follicles, analogous to follicular pharyngitis, suggested the name *follicular erosion*.

The older text-books usually devoted a chapter to this subject, under the head of Ulceration of the Womb. The disease is really not ulceration, but erosion. Ulceration, except in specific and malignant disease, is rarely found on the cervix. Thomas, in his work on *The Diseases of Women*, apologized for the use of the word, and said:

"What is called ulceration of the cervix is called erosion or granular degeneration when it appears under the eyelids."

The presence, after parturition, of a part or all of the elements which compose the false cervix—that is, enlargement, erosion, eversion, patulous os, and cystic degeneration—is strong evidence of laceration; cystic degeneration of the mucous follicles is almost pathognomonic of laceration. The cysts, varying in size from that of a pinhead to that of a small marble, feel to the touch like small shot scattered throughout the mucous tissues of the everted cervix. They

FIGURE 359.

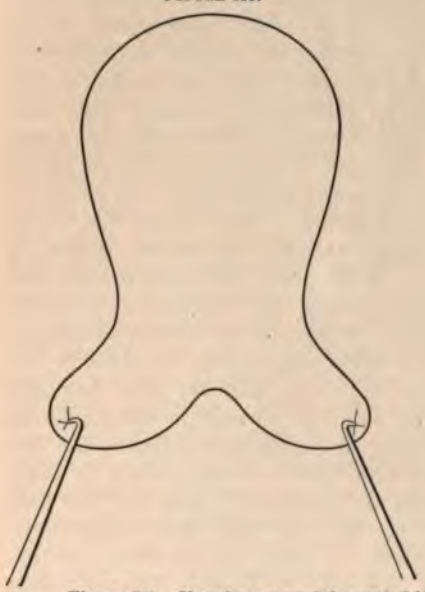


FIGURE 360.

Figure 359.—Showing everted, lacerated lips caught by tenacula and held apart.
Figure 360.—Showing lacerated lips caught by tenacula and rolled in.

are rarely found except on the lacerated cervix. As already explained, they are the result of occlusion and cystic degeneration of mucous follicles, the glands of Naboth. These follicles, except in cases of abnormal distribution, are entirely confined to the intracervical mucous membrane, and are not prone to cystic degeneration unless rolled out into the hostile environment of the vaginal secretions. This out-rolling seldom occurs except as the result of laceration. Hence cystic degeneration without laceration must be extremely rare.

The lesion, in ordinary cases, may be detected by touch and sight. Intelligent study of all cases, and accurate diagnosis in the more obscure, require the cervix to be exposed by a Sims or a Simon speculum, and the everted lips to be caught and rolled in by means of two uterine tenacula, one in each hand.

For complete diagnosis, in many cases the tenacula are absolutely essential. With these instruments Emmet first untied the knot and revolutionized the pathology and treatment of this cervical disease.

Edmund Randolph Peaslee, referring to the numerous cases of so-called ulceration, said[1] "they were not recognized, for none of us knew anything about them till Emmet told us. It was he who, in a happy moment, brought the anterior and posterior surfaces together with tenacula, and instantly demonstrated that what we all supposed an ulceration was nothing more nor less than a laceration."

The following quotation from Emmet's first systematic paper on this subject[2] presents a graphic picture of the gynecology of the last generation:

"November 27, 1862, I first operated for the relief of a double lateral laceration of the cervix by freshening the surfaces and bringing together the anterior and posterior flaps with interrupted silver sutures. This patient had been an invalid for several years before coming under my care, and had been treated for menorrhagia and hypertrophy of the uterus, with an extensive erosion. She was undersize, of a naturally delicate constitution, and after a severe and protracted labor, with difficulty had given birth to a large child. Her general appearance indicated incipient phthisis, but no evidence of a tuberculous deposit could be detected. The uterus was some four inches in depth, and an erosion extended about two inches in diameter over an enormous cervix. With great care this erosion had been healed several times, by maintaining the recumbent position for a sufficient length of time, but a relapse to the former condition recurred in every instance shortly after beginning to exercise by walking. I had almost despaired of being able to offer her any permanent relief, and attributed my want of success to the condition of her general health. While making a digital examination one day I was puzzled to account for the greater width of the cervix in comparison to that of the body beyond, a condition I had for the first time appreciated. I placed her on the left side and, with Sims' speculum, brought the cervix in view. I drew the posterior lip forward toward me with a tenaculum, but with no special purpose, when I was surprised to observe that it had decreased to nearly half its previous size. On lifting up the anterior lip with a tenaculum in the other hand, so as to bring the two portions into approximation, the outline of a cervix presented, of nearly normal size. The difficulty was at once apparent, for the parts had rolled back within the uterine canal, and a deep lateral fissure became evident, which extended on each side entirely through the cervix and beyond the vaginal junction. On separating the flaps and forcing them back to their former position, I saw the tissues gradually roll out, and the cervix again present its previous appearance. There could then be detected no appearance of laceration, and with the reduplication of vaginal tissue over the sides of the uterus, as I have already described, the cervix presented a normal length above its apparent junction with the vagina. The remedy at once suggested itself; the operation was performed with the

[1] Remarks after the reading of a supplementary paper on "The Proper Treatment of Laceration of the Cervix Uteri," by Emmet, before the New York County Medical Society, December, 1876. New York Medical Journal, January, 1877.

[2] "Laceration of the Cervix Uteri as a Frequent and Unrecognized Cause of Disease." American Journal of Obstetrics, November, 1874.

aid of my assistant, Dr. G. S. Winston, and I believe Dr. T. G. Thomas was also present. On completing the operation the uterus was five inches in depth; it rapidily reduced in size, and in time all evidence of local disease subsided, but she never entirely regained her general health. Some seven years after the operation Dr. F. N. Otis, of New York, her family physician, detected a tuberculous deposit, and she died of phthisis within a few months, having been ten years under my observation. For two years previous to her death she had resided abroad, but, as a friend, I was kept advised of her condition, and she continued free from uterine disease. I am fully satisfied that at the time of the operation her condition was so critical that it would have been but a question of a few weeks before a tuberculous deposit would have taken place. Although she never recovered fully the loss of vitality to which this injury had reduced her, yet her life was beyond question prolonged many years by the operation."

After the reading of this paper before the New York County Medical Society, September, 1874, J. Marion Sims said:

"When I went abroad in 1862, among the patients I turned over to the care of Dr. Emmet was the lady whose case forms the basis of the paper I have just read. She belonged to the upper walks of life, and had been under my charge for twelve or eighteen months. I remember the peculiarities of her case, so well described by Emmet, as vividly as if it were but yesterday. The bilateral lacerations of the cervix, and the consequent eversion of the hypertrophied, congested cervical mucous membrane, constituted at that time a difficult problem to solve. During the whole time that I observed this case no benefit resulted from local treatment, and I am sure that nothing short of the method so successfully adopted by Dr. Emmet could have been of the least service to her. I now only wonder that this operation had not been worked out sooner. When the perineum is lacerated the necessity for its reconstitution is self-evident, and it is singular that the necessity for reconstituting the integrity of a lacerated cervix did not sooner force itself upon the surgeon. The operation as devised and practised by Dr. Emmet is as simple, as safe, and as certain in its results as is the operation for a simple case of vesico-vaginal fistula. The same principles underlie each. The same free denudation of tissue, the same method of suture, the same after-treatment, and the same security from danger belong to both alike.

"I have performed the operation often enough to speak in positive terms of its value. The discussion of the subject must, of necessity, be one-sided. There can be no objection, no opposition to the operation. We must accept it as Dr. Emmet has given it to us. We cannot modify the operation; we cannot change it; we cannot improve it—for it is perfect; perfect in its method and perfect in its results.

"We owe to Dr. Emmet a debt of gratitude for this valuable contribution to uterine surgery. Like all new operations, it is likely to be abused; but the time will soon arrive when it will assume its place in the foremost rank of useful improvements."

After the subject had been discussed by other members of the

society, J. Marion Sims rose again, and said: "I am personally so impressed with the importance of Dr. Emmet's paper in a practical point of view, and so pleased with the manner in which he has presented it to our consideration, that I beg leave to move a formal vote of thanks to Dr. Emmet for his most valuable contribution to surgery."

Differential Diagnosis.

There is a form of erosion due to endometritis, associated with an irritating discharge from the endometrium or vagina, apt to occur in feeble and badly-nourished subjects, and not very uncommon in virgins; the condition is analogous to the familiar erosion and excoriation produced by prolonged nasal discharges on the upper lips of children. Such an erosion is readily distinguished from that of laceration by absence of eversion, by the absence of marked cervical enlargement, by the presence of a normally shaped os externum, and by physical examination soon to be described. The treatment is that of the causative endometritis.

Eversion of the non-lacerated cervical mucosa may in rare cases occur. It has even been observed in infancy.[1]

The disease most liable to be mistaken for laceration is beginning cancer of the cervix. A careful reading of the description of this disease will help to show the difference between the two conditions. Cancer bleeds freely on slight abrasion, is extremely friable, does not readily permit in-rolling with tenacula, and rapidly goes on to ulceration. Laceration presents none of these characteristics.

Prophylaxis.

The prophylaxis consists in the avoidance of all measures calculated to hasten unduly the normal progress of labor—that is, the avoidance of meddlesome manipulations by digital or instrumental interference. A precipitate second stage should, if practicable, be retarded. The relative disproportion between the child and the cervix may render all precautions useless and the tear inevitable.

The Operation of Trachelorrhaphy.[2]

It is not necessarily the extent of laceration, but rather the degree of out-rolling that indicates the necessity for repair. A relatively slight laceration may give rise to extreme eversion, and consequently to all of the pathological changes, already described, which belong to the false cervix. Furthermore, slight laceration without eversion may, if associated with great cicatricial formation or cystic degeneration, give rise to very distressing symptoms. On the other hand, a deep laceration may cause little or no disturbance.

Immediate Operation. Some obstetricians urge immediate closure of the torn cervix uteri. This operation, if successful, would have the same advantages as immediate perineorrhaphy—that is, less

[1] Noble. American Gynecological and Obstetrical Journal, February, 1897.

[2] E. C. Dudley, of Chicago, former interne at the Woman's Hospital, was the first to designate this operation trachelorrhaphy. Emmet's Principles and Practice of Gynecology.

danger of infection through the exposed surfaces, relief from long-continued dread of an operation, and freedom from the evil effects of any pathological changes consequent upon delay. There is, however, great difficulty in recognizing the limit of the fresh tear in the loose folds of the divulsed, soft, flabby cervix and the surrounding upper end of the vagina. The exact relations of the torn vaginal wall to the cervix are also difficult to define; for these reasons accurate adjustment of the torn surfaces may be difficult. The immediate operation, therefore, unless necessitated by profuse arterial hemorrhage, is of questionable value; when it is performed, the continuous catgut suture should be used.

Secondary Operation. In order to avoid out-rolling, thickening, cystic degeneration, endometritis, metritis, descent and other pathological changes, early repair of the extensively torn cervix is desirable. The operation is permissible as soon as the cervix has recovered from the immediate effects of extreme divulsion, and has regained, so far as the injury will permit, its normal form—that is, at the end of two or three months. Unfortunately, in the majority of cases, the lesion is not recognized or brought to the attention of the gynecologist until the resultant pathological changes have seriously impaired the health of the patient. It is the duty of the accoucheur to make, in the second or third week of the puerperium, an examination of the pelvic organs to determine the existence of any pathological condition which may demand additional attention. This is one of the imperative requirements of modern scientific midwifery.

Preparatory Treatment of complicating displacements and erosions, although advised by many, is not imperative. The treatment of a displacement may be necessary after the operation, and may properly be deferred to that time. Associated endometritis should be treated by preliminary curettage as a preparatory step in the operation for closure of the laceration; this will roll in and finally dispose of the eroded surfaces. If the eroded cervix be greatly thickened or complicated by extensive cystic degeneration, the diseased tissues should be removed by Schröder's method at the time of the operation.

It is difficult to discriminate between certain inflammatory conditions in the pelvis which contraindicate and others which indicate trachelorrhaphy. The operation, if performed in a case of acute pelvic inflammation or of suppurative inflammation, acute or chronic, is liable to be followed by general, possibly fatal, pelvic infection, and is therefore contraindicated. The presence, in the pelvis, of structures which are thickened, hypersensitive, or adherent—or, in other words, the non-purulent results of a former inflammation—does not necessarily contraindicate Emmet's operation. On the contrary, the improved uterine drainage secured by the preliminary dilatation, the removal of the products of endometritis, and of the original source of the pelvic infection by thorough curettage of the inflamed endometrium, and the rolling in of the irritable everted cervical mucosa, may be the most effective treatment for such pelvic inflammation.

Puncturing of Cysts. The follicular retention cysts already described, if present, will, unless properly treated, render the opera-

tion for closure of the cervix not only useless, but injurious. If, indeed, these diseased glands are rolled into the cervical canal by trachelorrhaphy, they are liable to enlarge, multiply, and remain a hidden source of irritation. Often they are so numerous and of such large size as to lead to the suspicion of cancer. If few in number and superficial, they may be punctured, or the projecting part of the cyst-wall may be caught with a tenaculum and removed by the scissors. The remaining part of the cyst-wall is then destroyed by nitric acid or the galvano-cautery. Several treatments may be required before the cervix is ready for operation. Extensive cystic development, especially on the thickened cervix, extending up into the cervical canal, requires excision of the diseased tissue. Simple puncturing of the cysts by the spear-pointed lance is inadequate because, unless the secreting surface be destroyed, the cysts are prone to refill. See Schröder's Operation.

Instruments for the Operation. The following instruments are required.

Sims' speculum and depressor.
Two uterine tenacula.
Emmet's uterine dressing-forceps.
Emmet's slightly-curved and full-curved scissors.
Emmet's needle-forceps.
Short hæmostatic forceps.
Needles.
Four sponge-holders.
Gauze or sea sponges.
Catgut or silkworm-gut.
Rubber sheet or Kelly's pad.
Hank's vulsellum forceps.
Instruments for dilatation and curettage.

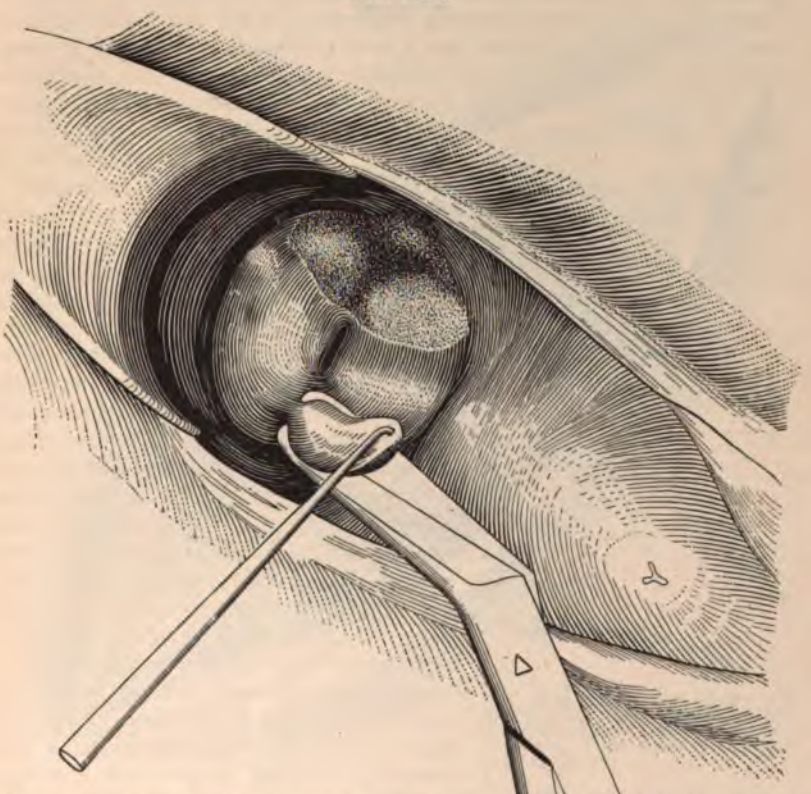
Many operators prefer the Simon to the Sims speculum; the writer strongly prefers Sims'. Education and habit will, however, fix the choice, which should be limited to these two instruments. The needle with bayonet trocar, or glover's point, is preferable to that with the round point; the latter is difficult to introduce through the indurated tissue without breaking. The full-curved needle is unmanageable; the force required for its introduction is exerted in the line of a tangent to the curve, and is therefore more liable to break the needle than when exerted in the direct line of the straight needle. It may also be difficult to estimate the location of the point of a curved needle. There are practical advantages in a needle slightly curved at the point, but otherwise straight.

Disinfection. The general measures to an aseptic result have been detailed in Chapters II. and V. Under anæsthesia the patient being on her back, the vaginal and external genitals are thoroughly scrubbed with water and green soap. When the soap has been washed off with hot, sterilized water, the disinfection is completed by an additional washing with a 1 to 2000 solution of bichloride of mercury. A conjoined examination is now made in order to obtain information of any condition which before anæsthesia may

have been overlooked. This examination, since it occasionally reveals conditions which may modify or contraindicate the operation, is important. If no contraindication for the operation appears, the patient is placed in Sims' position and the cervix exposed by Sims' speculum. The uterus is now dilated and curetted, washed out, and treated with an intra-uterine application of iodine and carbolic acid. This disinfects the endometrium and decreases the risk of infection.

Preliminary Dilatation and Curettage may be required only for the purpose of exploration, in order to determine the presence or

FIGURE 361.



Manner of denudation with uterine tenaculum and Emmet's curved scissors. One side denuded, the other partly denuded. Left latero-prone position; exposure by Sims' speculum.

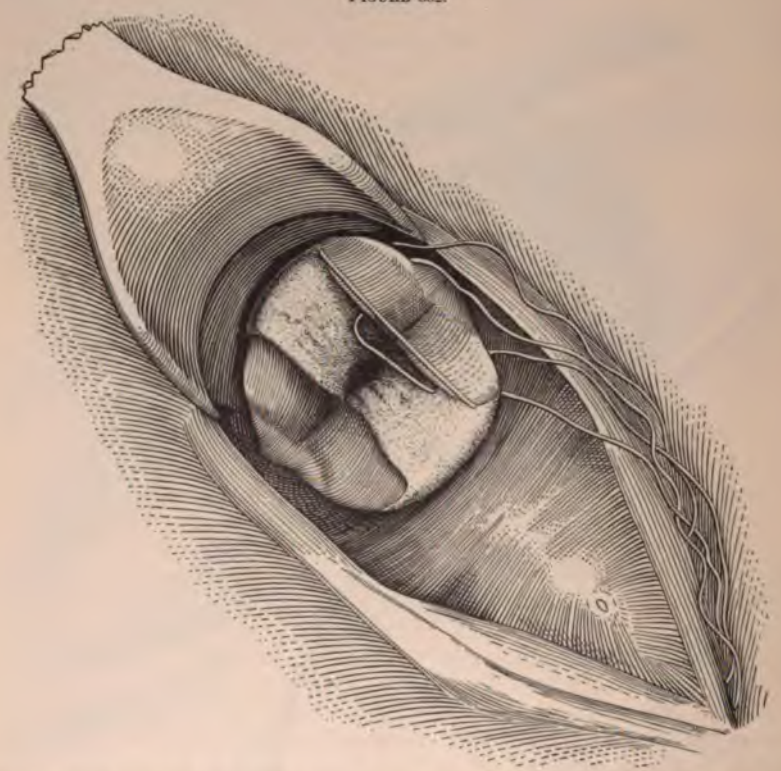
absence of complicating endometritis. If endometritis exists, the object of dilatation and curettage is to prevent infection of the wound and failure of union from contact of the pathological secretions of the diseased endometrium, to secure efficient drainage of the endometrium, and thereby to prevent the retention, stagnation, decomposition, and absorption of its secretions, and to avoid leaving an infected endometrium, which, after closure of the cervix, might by extension involve the parametria, uterine appendages, and peritoneum, in di

or dangerous inflammation. For these reasons preliminary dilatation and curettage are demanded.

Approximation. Before proceeding to the closing of the cervix, a careful study is made of the direction or directions and extent of the injury, by trial approximations of the torn fragments in various ways by means of a tenaculum in each hand. If it be a simple bilateral laceration, the operation is as follows:

Denudation. With the tenaculum and curved scissors the surfaces to be united are denuded. Figure 361 shows the manner of denuda-

FIGURE 362.



Shows the surface denuded and two sutures in place, but not tied. Left latero-prone position; exposure by Sims' speculum.

tion. Inasmuch as one of the important functions of the uterus is drainage, it is essential to leave a wide and free outlet at the external os. To this end that portion of the undenuded mucosa which is to line the restored external os is left wide, so that when united the normal trumpet-shape of the lower segment of the cervical canal will be preserved. Sufficient allowance must also be made in the denudation for involution that will take place after the operation. This is essential, for immediately after the operation the diameter of the

restored external os should be larger than normal, so that the involution that follows the operation will ultimately reduce it to the normal calibre. Figure 364 shows the properly curved lines between the denuded and undenuded surfaces. Extreme stenosis at the external os, sometimes amounting to complete atresia, is a possible result of inattention to this important detail.

The evil consequences of stenosis and obstruction to the uterine secretions and menstrual fluid will be apparent from the following: 1. Recurrent distention of the uterus from accumulation of the secretions, which may even distend the Fallopian tubes, is almost certain to occur. 2. Consequent metritis and infection of the uterine appendages may give rise to immediate disastrous results or may remain a source of chronic irritation and bring about a state of persistent invalidism. 3. The rapid and complete relief which often follows the reopening of a contracted cervical canal and os externum proves that the integrity of the uterine canal as a natural drainage tube is essential to health.

Removal of the Cicatricial Plug. The denudation should always include the removal of the plug of cicatricial tissue from the angle of the laceration. This important step in the operation, if disregarded, may prevent the easy approximation of the denuded surfaces, cause the sutures to cut out from undue tension, and result in a failure of union or in imperfect union. Failure of union, however, under such conditions would be a fortunate compromise for the patient, since the cicatrix is much less injurious with the laceration open than closed. When, unfortunately, union has taken place, the consequent train of nervous symptoms may necessitate reopening of the wound and removal of the cicatricial plug.

FIGURE 363.

C. Exaggerated view of the cicatricial plug. The dotted lines show lines of incision for its removal. Very few cases would require such extensive excision.[1]

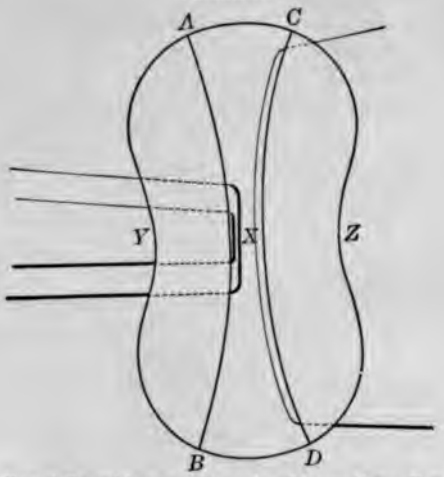
Hemorrhage. The usual slight bleeding is readily controlled by sponge pressure. Arterial hemorrhage, if not controlled by forcipressure or torsion, may require a fine catgut ligature. In some cases the bleeding must be checked by the application of one or two deep sutures.

The Sutures may be of silver wire, catgut, or silkworm-gut. Silver wire is objectionable because it is unwieldy; moreover, asepsis has rendered it unnecessary. Silkworm-gut remains aseptic longer, and is therefore superior to catgut. If the perineum is closed at the same time, the difficulty in the removal of the sutures may justify the use of absorbable catgut, which does not have to be removed. Catgut may also be used in the repair of all small lacerations, especially where the surfaces readily fall together and remain in apposition

[1] After Emmet. Principles and Practice of Gynecology.

n. As ordinarily prepared, it is absorbed too soon. or chromicized catgut resists absorption long enough

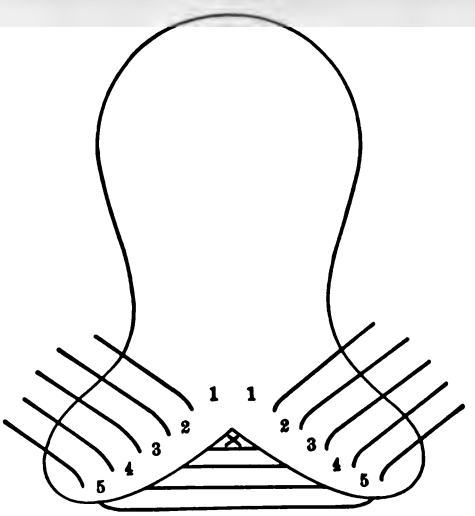
FIGURE 364.



A line connecting *Y*, *X*, and *Z* would represent angle of laceration; *X*, section of uterine canal at angle of laceration. Three of the sutures in place. Diagrammatic.

to insure solid union. In order that the sutures may not convey possible infection to the wound, they should in all plastic surgery, so far as possible, be passed under and not through the denuded surfaces.

FIGURE 365.



Sutures in place on one side ready to tie. Diagrammatic.

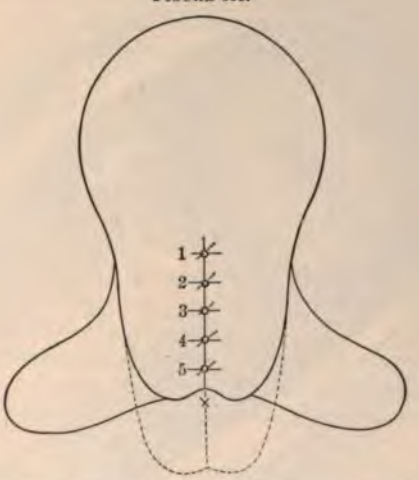
This principle is illustrated by the dotted lines in Figure 364; the surfaces between the lines *A B* and *C D* is left undenuded, to form

that part of the cervical canal which is to be restored. Two sutures, as indicated, have been passed on one side, and one on the opposite side. When all the sutures have been tied they will bring the surface *A YXZC* in contact with the surface *B YXZD* in such a manner that point *A* will coincide with point *B*, and point *C* with point *D*. The lines *A C* and *B D* will then bound the restored external os.

Figure 365 shows the same laceration from another point of view. The sutures on one side are represented as all having been introduced before any are tied. This was the plan formerly pursued when the silver suture was used. It is better to tie the silkworm-gut or catgut sutures as they are introduced.

Figure 366 shows the sutures tied, the everted mucosa rolled in, and the operation complete.

FIGURE 366.



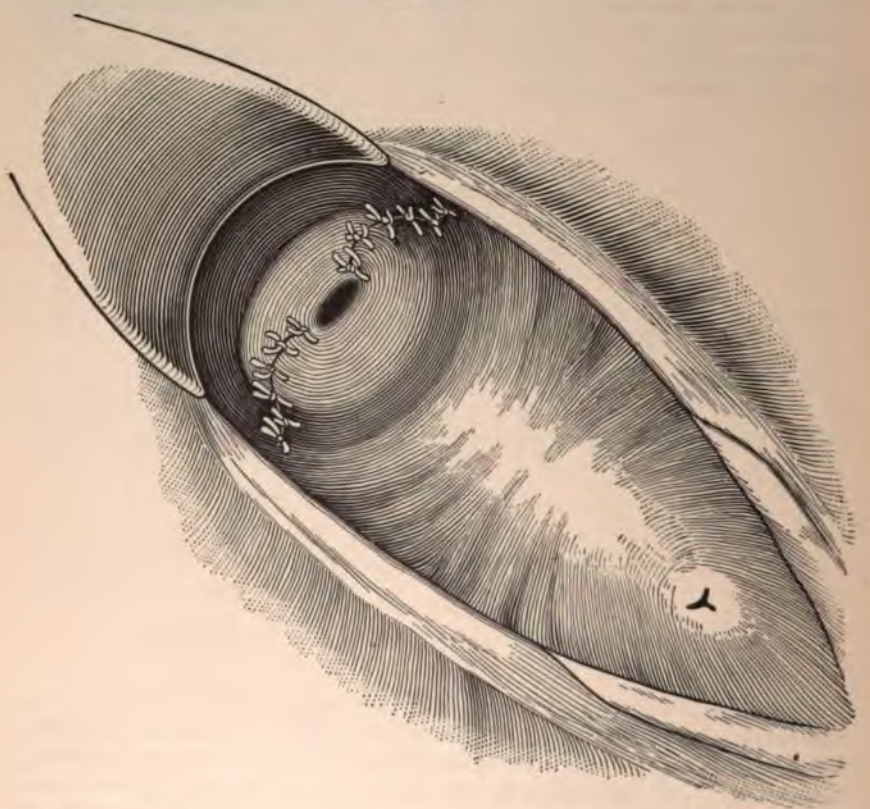
Showing the rolling-in effect of the operation. Sutures tied. Diagrammatic.

A study of Figures 365 and 366 will disclose an interesting fact in the mechanics of laceration and trachelorrhaphy. If in the subinvoluted uterus represented by Figure 365 the distance from the angle of laceration, ×, to the fundus is, say, three inches, and the distance from the angle of laceration to the margin of the torn lip is one inch, it would appear reasonable to assume that the uterine canal, when fully restored, would measure four inches. Accurate measurements of the uterine canal, however, before and after operation almost always show a decrease, not an increase, in its length. In a uterus of such dimensions, the canal, after operation, would usually measure not four, but about two and three-quarters inches. The explanation of this decrease is as follows:

As shown in the pathology, the intra-uterine mucosa rolls out, and the lowest portion of the uterine canal becomes the external os of the lacerated cervix, point ×, Figure 365. In tying the first suture points 1 and 1 are not only brought together to form one and the

same point, but all mucosa above this suture is at the same time rolled into the uterine canal, so that point × moves up and point 1 takes its place. On the successive tying of the other sutures, 2, 3, 4, and 5, the same mechanical result is observed, so that finally suture 5, when tied, occupies the place formerly occupied by ×. All the mucosa between 1 and 5 on one side, and 1 and 5 on the other, is now rolled into the uterine canal above the original level of point ×. This

FIGURE 367.



Left latero-prone position; exposure by Sims' speculum. The sutures tied and the cervix united, as seen looking through the speculum into the vagina. Notice the lines of union running from the os over the cervix across the utero-vaginal attachment into the reflected vaginal wall. In this case, as in all others, a great part of the tear is in the vaginal walls.

mechanical result alone abundantly justifies the operation; it also verifies the propositions laid down in the preceding paragraphs on the mechanical results of the lesion.

The reasons for so great a decrease in the length of the uterine canal may not be wholly apparent from the foregoing. The following reasons, in addition to the rolling-in of the everted tissue, are therefore submitted: Loss of blood and tissue in denuding; evacuation or

removal of retention cysts; contraction of muscular fibre due to the stimulus of the operation; and, above all, relief from congestion, which naturally follows restoration of everted intra-uterine structures to their normal position inside of the uterus. The out-rolled structures were, so to speak, in a state of erection.

Operation for Atypical Lacerations. The closure of a unilateral, anterior or posterior laceration follows the rules already down for simple bilateral injuries. Stellate lacerations may in some cases be treated by closure of each individual tear; or, if two are very near together, they may be changed into one by the removal of the intervening tissue. There may be one or two major and several minor rents; in such a case the surgeon may sometimes disregard the small fissures, and by rolling in the everted cervix, as indicated by the deeper tears, find that the smaller ones disappear within the canal, and may therefore be ignored in the operation. It is impossible to anticipate every variation in the direction and effect of the injury. Each atypical case must be treated according to its special requirements.

Resection of the Cervix. In a large proportion of cases of laceration of the cervix the lesion is unrecognized, neglected, or unskilfully treated, so that extensive pathological changes occur. These changes may either prevent or contraindicate the rolling in of the diseased tissues; or, if the cervix has been improperly closed, may require it to be reopened. They are:

1. Great thickening and induration of the lacerated lips, which, if possible to roll into the uterine canal at all, would cause traction upon the sutures, and result in their cutting out; or, if union should occur, the induration and thickening might persist and give increased trouble.

2. Extensive cystic degeneration of the Nabothian follicles. The evil results of rolling these cysts into the cervical canal have already been mentioned.

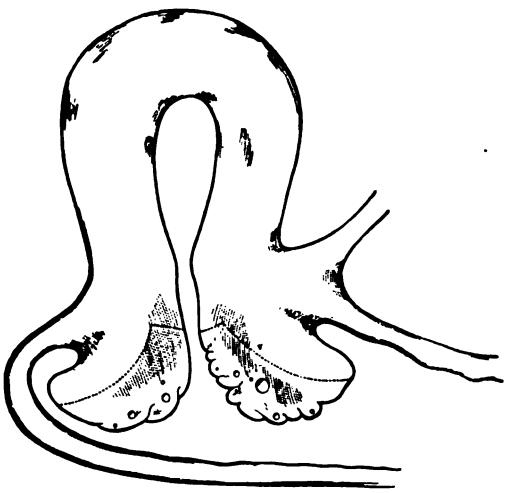
3. Endocervicitis, with deep involvement of the cervical glands, and a consequent profuse discharge of a ropy, tenacious, gelatinous secretion. The only satisfactory treatment of this condition is excision of the diseased structures. Their destruction by the actual cautery or sharp curette is apt to be followed by contraction and stenosis of the cervix.

4. Stenosis in the lower portion of the cervical canal and os externum. This condition may be due to too tight closure of the cervix or to cicatricial contraction from curettage, cauterization, or other causes.

Under the conditions named above, the diseased tissue should be removed by resection of the cervix—Schröder's operation.[1] The technique of the operation is as follows: The diseased tissue is removed by incisions as indicated in Figure 368; the vaginal margins of the wound are then stitched, both anteriorly and posteriorly, with fine chromicized or formaldehyde catgut, to the margins of the intracervical mucous membrane. By this means the anterior

[1] Emmet had for many years before the publication of Schröder's operation performed an operation in principle like Schröder's, but differing in technique.

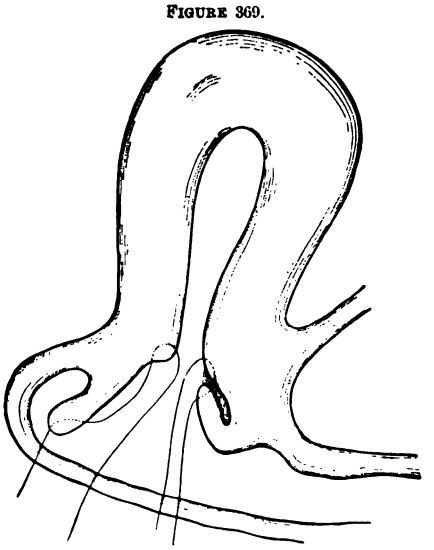
FIGURE 368.



Shows a thickened diseased cervix requiring resection. The dotted lines indicate the directions of the incisions

and posterior lips of the cervix are folded upon themselves. The first stage of the operation is now complete, and the condition becomes that of an uncomplicated bilateral laceration. The re-

FIGURE 369.



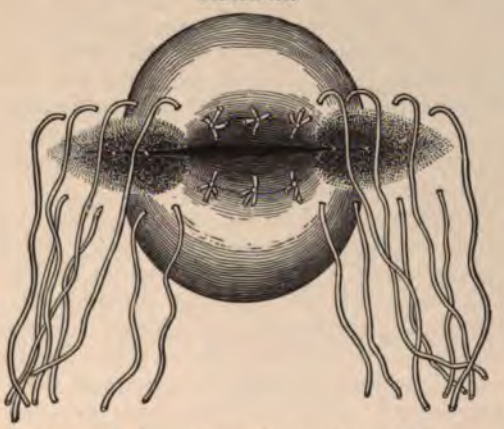
Shows the diseased tissues excised and sutures in place, but not yet tied, to unite the vagina margin to the cervical margin of the wound.

mainder of the operation is the same as that of trachelorrhaphy, already described.

Before proceeding to the excision of the diseased structures, it is

often necessary to supplement Schröder's operation by deep lateral incisions with the scissors. By this means the anterior and posterior lips may be widely separated far up into the uterine canal, and the diseased structures thoroughly inspected and efficiently removed. The diseased tissue is best removed by seizing it in small vulsellum forceps and cutting it out with two or three strokes of the scissors.

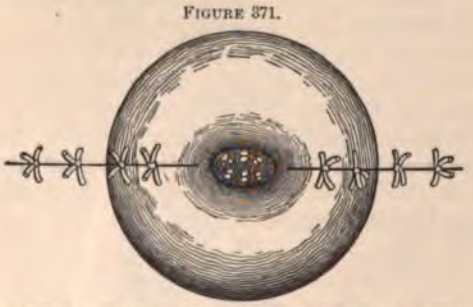
FIGURE 370.



Anterior and posterior vaginal margins, each turned into cervical canal and united by means of fine catgut sutures to the intracervical margins of the wound. Lateral surfaces denuded and sutures placed as in ordinary trachelorrhaphy, but not yet tied.

The frequent closure of the lacerated cervix without the removal of these diseased structures accounts for numerous failures and disappointments in the operation.

FIGURE 371.



All sutures tied; operation complete. The white dots in the os represent the protruding intracervical sutures.

The brief report of a single case[1] will serve to illustrate the importance of resection. Trachelorrhaphy had been performed ten years previously. From the time of that operation the patient had suffered from pronounced catalepsy, with frequent paroxysms. Examination showed an enormously thickened cervix with a pinhole os. Both ovaries were slightly enlarged and adherent. In order to ascertain the condition

[1] Dudley. The Abuse of Emmet's Operation for Laceration of the Cervix. Journal of the American Medical Association, September 23, 1893.

of the interior of the cervix, very deep bilateral incisions were made: the anterior and posterior lips were separated more widely than would be usual in an extensive laceration of the cervix. Much pent-up secretion which escaped showed that the tight closure of the os externum had converted the whole endometrium into a retention cyst. Numerous cysts of the Nabothian follicles, superficial and deep, large and small, appeared in the intracervical mucosa and submucosa. In the excision of these cysts the cervical mucosa and submucosa were removed almost to the internal os; the vaginal and intracervical margins of the wound were united with catgut sutures, as shown in Figure 338. What remained of the lateral incisions was then closed with interrupted silkworm-gut sutures. The operation, except the very deep lateral incisions, was practically that of Schröder. Since recovery from the operation the patient, though naturally neurotic, has reported herself free from cataleptiform seizures.

The After-treatment consists of rest in bed for about ten days, a vaginal douche of hot sterilized water twice daily, and the removal of the sutures through Sims' or Simon's speculum in about two weeks. If the perineum and cervix are closed at the same time, the pressure of the speculum during the removal of the cervical sutures does not, with careful manipulation, endanger the freshly-united perineum, provided the perineal sutures are still in place; if they have been removed, it is necessary to delay removal of the cervical sutures until the perineal union is solid—that is, for an additional two or three weeks. It is better, however, in the double operation, as already stated, to use in the cervix the absorbable catgut sutures, which do not have to be removed at all.

Results. Trachelorrhaphy in suitable cases, properly performed with due regard to asepsis, is one of the most satisfactory operations in gynecology. Union by first intention is the almost invariable rule. The relief from symptoms is often very great.

Disappointment in the operation may result from neglect to treat the complicating endometritis; from the rolling in of hopelessly diseased structures, which ought to have been excised; from disregarding such contraindications as pelvic suppuration; from closing the os externum so tightly as to obstruct the natural outflow of uterine secretions; from the unwise selection of cases; and, above all, from faulty technique in the operation itself.

CHAPTER XLIII.

GENITAL FISTULÆ.

Priority in the Operation for Genital Fistulæ.

UNTIL forty years ago, when the operation for the closure of vaginal fistulæ was developed and, in practical form, given to the world by the late J. Marion Sims, these most distressing injuries had been incurable. The invention of Sims' speculum, which made the operation possible, has a significance, however, more far-reaching than the mere recognition of a valuable operation, for it marks an epoch in the history of gynecology. The operation furnished the initiative for the period of great practical activity which followed. It will in no respect detract from the credit which justly belongs to the great pioneer if we admit the fact that the honor of perfecting and perpetuating the methods upon which his operation was based, and upon which modern gynecology has made its greatest development, must be divided between J. Marion Sims and Thomas Addis Emmet.

Varieties of Genital Fistulæ.

A fistulous opening may connect the interior of the uterus or vagina with some part of the urinary or intestinal tract. Accordingly, the varieties of genital fistulæ are urinary fistulæ and fecal fistulæ.

FIGURE 372.

1. Vesico-uterine fistula. 2. Vesico-utero-vaginal fistula. 3. Vesico-vaginal fistula. 4. Urethro-vaginal fistula. 5. Recto-vaginal fistula. 6. Perineo-anal fistula. 7. Anal fistula.

Figure 372 shows the more common varieties of genital fistulæ. They are:

Vesico-vaginal fistula.
Vesico-uterine fistula.
Vesico-utero-vaginal fistula.
Urethro-vaginal fistula.
Recto-vaginal fistula.

The following other forms are of rare occurrence: The ureter may communicate directly with the vagina, making a *uretero-vaginal fistula*. The ureter may open into the margin of a vesico-vaginal fistula, making a uretero-vesico-vaginal fistula. Various other rare forms, such as uretero-uterine fistula, should be classed as surgical curiosities.

The causes of genital fistulæ are these:

Impaction of the presenting part during labor and consequent pressure necrosis.

Direct traumatism.

Congenital causes—that is, defective development.

Ulcerative and other destructive processes from syphilis, cancer, and inflammation. Burrowing of pus from an abscess.

VESICO-VAGINAL FISTULA.

The definition of the lesion is apparent from the uame—that is, a fistulous opening between the bladder and vagina.

Etiology.

In the vast majority of cases the lesion results from impaction of the presenting part during labor and consequent pressure necrosis in the vesico-vaginal wall. Completion of the necrotic process and separation of the slough require from five to twelve days; hence, in fistula from this cause, the essential symptom, escape of urine through the vagina, does not occur until several days after labor.

A fistulous opening is sometimes purposely made by a surgical operation for the treatment of cystitis or for the removal of stone in the bladder, or it may be the result of accidental traumatism. The escape of urine will then be immediate. Congenital fistula is rare, and is characterized by the involuntary escape of urine from the time of birth. The ulcerative processes of syphilis, cancer, and inflammation are much more frequently the cause of fecal than of urinary fistula.

Symptoms and Course.

The constant symptom, already mentioned, is the escape of urine from the bladder through the vagina. The fistula may vary from the size of a pinpoint to that of the entire vesico-vaginal wall. When the opening is of appreciable size or large, the flow of urine is usually continuous. In very small fistulæ the escape of urine may be intermittent. The intermission is apt to occur when the woman is lying down. In rare cases of small fistula a valve-like formation may shut off the flow of urine except when the woman assumes certain positions favorable to its escape.

A Cause of Cystitis. In the majority of cases there is more or less residual urine in the bladder. This is a good culture-medium for the bacteria which now find ready access from the vagina; hence cystitis is a usual complication. From this cause the urine becomes alkaline, ammoniacal, and excessively irritating. The vagina, external genitals, thighs, and buttocks, over which it flows, become excoriated, œdematous, and ulcerated. A gritty, offensive phosphatic deposit may form and deeply incrust not only these surfaces, but also the raw margins of the fistula and the bladder mucous membrane.

This deposit is specially apt to accumulate and form incrustations on ulcerated and otherwise exposed surfaces. It may fill the vagina and even extend over the ulcerated labia. The inside of the bladder, perchance deeply ulcerated, granulating, incrusted, bleeding, and excessively painful, may, if the fistula be large, become inverted and protrude in a semi-strangulated condition between the labia majora.[1] The patient, within a few weeks after labor, will then, unless great care is exercised, become an object of loathing and pity.

Diagnosis and Prognosis.

The opening, if sufficiently large, may be felt by the finger in the vagina. The fistula, having been thus located, the finger may be used as a guide for the passage of a sound through the urethra into the bladder, and thence through the fistulous opening into the vagina.

When the fistula is very small it is sometimes difficult or impossible to see it even after careful search through the speculum. In such a case, the speculum being in place, the bladder should be injected through the urethra with sterilized colored water. The point at which this fluid escapes into the vagina will locate the fistula.

Prognosis.

The prognosis depends upon the extent of the injury, the amount of cicatricial tissue, and the difficulty of approximating the margins of the fistula. In exceptional cases of small opening, in which the margins lie in easy and close apposition, they may, if kept clean, soon unite without operative interference. The vast majority of fistulæ, however, unless united by suture, are permanent.

Prophylactic Treatment.

The statistics of Emmet, covering a long series of cases of vesico-vaginal fistula,[2] show that the average duration of labor from the time of rupture of the membranes to the birth of the child was between two and three days. Statistics further prove that impaction and consequent continued pressure of the presenting part upon the vesico-vaginal septum, even for a few hours, are very liable to result in cutting off the circulation and consequent death and sloughing of the compressed tissue. If, therefore, in any case impaction becomes apparent by the failure of the presenting part to advance during the pains and to recede in the interval between the pains, delivery should be hastened and terminated without unnecessary delay. The possible danger of a forceps operation in such a case, even by the inexperienced hand, when compared with the danger of fistula, would be insignificant.

Emmet's records show that in nearly all of his cases parturition had taken place either without attendance or under the care of ignorant midwives. In some cases labor had finally terminated by the unaided efforts of nature, and in others by the use of the forceps. In the latter class of cases delivery is usually accomplished by a consultant, who is not called until after prolonged, continuous pressure has destroyed the vitality of at least a part of the vaginal wall. Sometime-

[1] Emmet. Principles and Practice of Gynecology. [2] Ibid.

the fistula is wrongly attributed to the forceps or other instruments, instead of the real cause—prolonged pressure—a cause which earlier interference would have prevented. As Thomas wisely remarks, the truth on this point should be clearly set forth, "for unless it be so, an incompetent person may shield himself from merited blame by casting censure upon a consulting physician, by whose efforts the lives of both mother and child may have been saved; or a skilful operator may suffer unjustly in a suit for malpractice."[1]

Emmet's statistics show that in a large proportion of cases the bladder was not emptied during the progress of labor. This neglect would cause large accumulation of retained urine and great distention of the bladder. The result would be paralysis of the bladder and cystitis. Moreover, the impaction would be increased by the pressure exerted on the bladder side of the vesico-vaginal septum, and this pressure would be an additional cause of necrosis. Catheterization, therefore, as a prophylactic measure is an urgent necessity.

After delivery in a case of continuous and prolonged impaction, decided antiseptic measures are indicated to prevent or limit the threatened necrosis. They are:

1. A vaginal douche of ½ per cent. lysol, or some other appropriate antiseptic, every eight hours.
2. Daily washing out of the bladder with a saturated solution of boric acid.
3. Sufficiently frequent catheterization to prevent great accumulations of urine and consequent bladder distention.

Surgical Treatment.

The surgical treatment includes the preparatory treatment, the operation, and the after-treatment.

Preparatory Treatment. If the parts are brought into a condition favorable for union, the operation for the cure of vesico-vaginal fistula, even with ordinary skill, is one of the most satisfactory in the whole field of surgery. On the other hand, the most skilful operation, with faulty preparation, is almost certain to fail.

The margins of the fistula cannot be brought into a healthy condition and made fit for union until the phosphatic deposit, already mentioned, has been removed, and its further formation prevented. In order to prevent its formation, the urine should be rendered acid; otherwise the deposit will accumulate on the sutures and in the lines of union, and cause the operation to fail. It does not, however, develop in acid urine. Emmet's mixture of benzoic acid, two drachms; borax, three drachms; and cinnamon water, twelve ounces, gives uniformly good results. A tablespoonful, further diluted, should be taken four times a day until the urine becomes mildly acid. The dose should then be so regulated as to maintain normal acidity and to avoid deranging the digestion. In order to dilute the urine and render it less irritating, pure water, preferably rain-water or distilled water, should be given quite freely. If the urine is kept only slightly acid and diluted, the phosphatic deposit once removed will not return.

The removal of the deposit is best accomplished by means of a

[1] Thomas. Diseases of Women.

dressing-forceps, or it may be brushed off with a wad of cotton in the grasp of the forceps. Then apply to the raw surfaces, by means of an applicator wound with cotton, a solution of silver nitrate, ten grains or more to the ounce. Sometimes the deposit adheres very firmly, as if it were interlaced with the adjacent tissue, so that immediate removal would be too difficult or painful. Emmet then applies a stronger solution or even the solid stick of silver nitrate to the deposit itself. This may be repeated every few days until the deposit is detached.

The hot vaginal douche described in Chapter IV., although no longer considered a gynecological panacea, is of the utmost value in the preparatory treatment. It should be freely given several times a day, and large quantities of hot water should be used. This part of the treatment, as Emmet declares, is indispensable. The sitz-bath also is most useful and grateful to the patient. The douche may be given to advantage while the patient is in the sitz-bath. This treatment, merely insuring perfect cleanliness, has resulted in some cases, even of large fistula, in complete closure. They were cases, however, in which there had not been great loss of tissue, and in which the edges of the fistula were in apposition.

The excoriated or eroded surfaces about the nates or thighs are best treated by frequent bathing, followed by applications of benzoated zinc oxide ointment. Napkins like menstrual napkins should be worn over the vulva to absorb the urine, and should be frequently changed; otherwise the urine which they hold will decompose and become excessively irritating to the skin. Points of ulceration may be touched with solid silver nitrate.

Cystitis, if present, is a clear contraindication to the immediate closure of the fistula. The copious hot-water vesico-vaginal douche, frequent and prolonged, is the best means of treating this complication. It is given as an ordinary vaginal douche, except that the hot water, instead of being thrown in by the douche point through the vulva, is introduced through the urethra. For this purpose a glass urethral catheter or canula small enough to enter the urethra is used in place of the vaginal douche point. The hot water is by this means first freely applied to the bladder, and then through the fistula to the vagina and vulva. Cystitis in these cases, as already explained, is sometimes the result of residual urine. It may therefore be necessary, especially in a very small fistula, to secure adequate drainage of the bladder by an incision in the vesico-vaginal wall. If the fistula is situated in or near the median line of the vesico-vaginal septum, the incision should be so made as to enlarge it, otherwise an independent opening should be made. See Treatment of Cystitis by Means of Artificial Vesico-vaginal Fistula, in Chapter XXIV. Old inflammation of the kidney or ureter may be present, and if in an advanced stage might contraindicate the operation; hence the importance of the rule to examine the urine in every case. The urine may be collected for examination by keeping the woman on a bedpan until a sufficient quantity has accumulated.

Stone in the Bladder, free or encysted, may in rare cases have ante-

dated and even been a cause of fistula—that is, the vesico-vaginal septum during labor may have been compressed between the stone and the child's head. Usually, however, the calculus is deposited from the residual urine already mentioned among the frequent results of fistula. The necessity for the removal of such a stone before closing the fistula is apparent.

Direction and Manner of Closure. The urine being normal, the vagina and bladder healthy, and the structures surrounding the fistula fit for union, the next step will be to decide upon the best direction and manner of closure. It is desirable, if possible, to bring the parts together from side to side, so as to make a line of union as nearly as possible in the line of the long axis of the vagina. This preserves the length of the vagina. A line of union transversely across the vagina would shorten its anterior wall, and would draw down the uterus and fix it in permanent displacement.

FIGURE 373.

Vesico-vaginal fistula exposed by Sims' speculum. Approximation of the margins attempted by means of sutures. Left latero-prone position.[1]

Unfortunately, in many cases of extensive sloughing, the margins of the fistula cannot be approximated from side to side. They may even be so held apart by cicatricial bands that they cannot be approximated at all, or there may not be tissue enough left to fill the gap. In order to decide upon the best mode and direction of closure, the fistula should be exposed by Sims' speculum, and its margins at

[1] Thomas, Principles and Practice of Gynecology.

different points seized on opposite sides and drawn together with a tenaculum in each hand. In this way one may judge of the amount of force required to approximate the edges, and of the direction in which they will come together with the least traction.

It is an urgent rule never to introduce sutures unless the surfaces to be united can be held in contact without traction; even a little traction on the sutures will cause them invariably to cut out and the operation to fail.

If the restraining bands are so light and superficial that moderate traction with tenacula suffices to approximate the margins of the fistula, they may be divided by scissors until the margins readily fall together. The surfaces may then be immediately denuded and the sutures introduced.

If the sloughing has been very extensive, one or more preliminary operations may be necessary. Emmet places the patient on her back, introduces two fingers of the left hand into the rectum, and the thumb of the same hand into the vagina. The interior of the vagina is thereby rolled out and exposed without a speculum. The right index-finger in the vagina now detects the points of greatest cicatricial tension. Point after point is snipped with the blunt scissors in such a way as to render the margins of the fistula more readily approximated. If the cervix uteri has sloughed, the relations of the remaining portion of the uterus to the upper part of the vagina, even by rectal touch, may be difficult to make out. There is then great danger of wounding a misplaced ureter or of entering the peritoneum. This danger is lessened by the careful use of the sound held by the hand of an assistant in the bladder.

The vagina having been opened as freely as may at the time be deemed prudent, Emmet[1] directs that a Sims glass or hard-rubber vaginal plug be introduced and held in place by a T-bandage. It should be sufficiently long and wide to keep the vagina well stretched both longitudinally and laterally, and to control hemorrhage by pressure, but not so large as to cause pressure necrosis and sloughing. Under this pressure, absorption of cicatricial tissue is rapid. The continued stretching of the vagina also increases its calibre and renders the ap-

FIGURE 374.

Sims' glass vaginal plug.

proximation of the margins of the fistula less difficult. The dilator may have to be retained for several weeks until the incisions have healed over it; in the meantime it may be removed daily for cleansing douches. The patient should be kept in bed for a week or two after the operation, and the urine should, if necessary, be drawn with a catheter. After healing has taken place, the operation may be re-

[1] Principles and Practice of Gynecology.

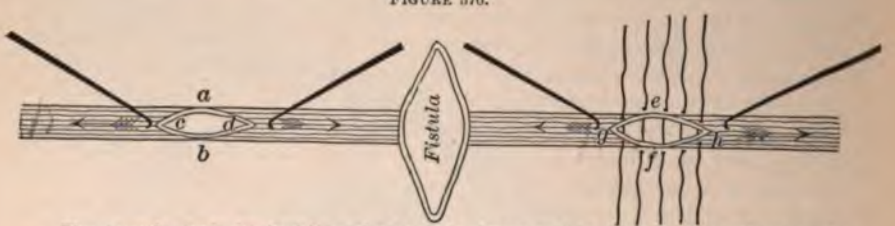
peated; or, if the margins of the fistula can be brought together without tension, the sutures for closure may be introduced.

FIGURE 375.

1, 2, and 3, 4, represent the restraining cicatricial bands on each side of the fistula; *ab* and *ef* show the lines of incision.

In place of the incisions and glass dilator just described, the restraining cicatricial bands may be deeply and freely divided and the wounds closed at right angles to the lines of incision. The operation is illustrated in Figures 375, 376, and 377. This preliminary plastic

FIGURE 376.



The wounds made by incisions *ab* and *ef* are drawn widely apart by tenacula so as to give the wound on either side, the direction of *cd* and *gh*. Sutures are in place on right side.

work may, according to indication, be done at the time of closing the fistula or as a separate operation.

FIGURE 377.

Incised wounds on both sides of the fistula closed at right angles to lines of incision. The edges of the fistula now readily fall into apposition. Sutures for closure of fistula in place, and two of them tied.

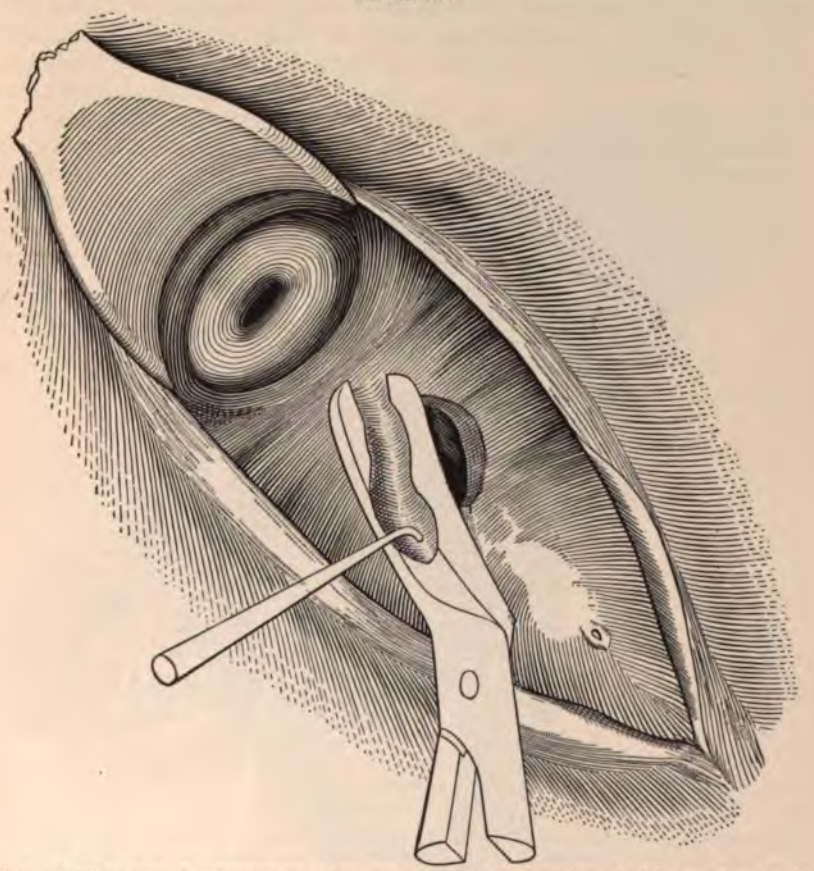
The preparatory treatment outlined above may be difficult, long continued, and most trying to both patient and surgeon. Fortunately, there are many cases in which it is not required. When it is required the most skilful operation will fail without it.

The Operation for Closing the Fistula. This involves a consideration of the following topics:

1. General preparatory treatment.
2. Choice of speculum and method of operation.
3. Choice of direction for closure of the fistula.
4. Denudation.
5. Introduction of sutures.
6. After-treatment.

1. *The general preparatory treatment* and arrangements for plastic operations described in Chapter II. are applicable and adequate for this operation.

FIGURE 378.



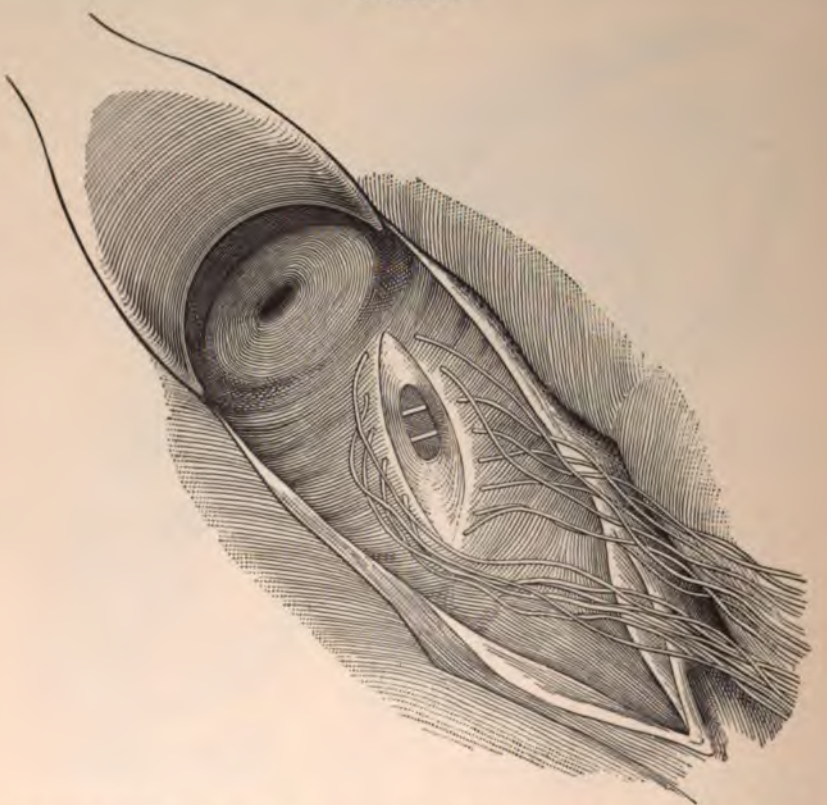
The use of the uterine tenaculum and Emmet's scissors in denudation. Left latero-prone position; exposure by Sims' speculum.

2. *Choice of Speculum and Method of Operation.* The author's choice between the method of Simon, with the patient in the dorsal position, the parts being exposed by numerous vaginal retractors, and the method of Sims, with the left latero-prone position and Sims' speculum, is based upon an extensive experience with both methods. The Simon method is serviceable and adequate for the ordinary case, but not always for difficult cases. This is especially true when the

fistula is near the vaginal outlet behind the ramus of the pubes. In fat subjects, moreover, the Sims position and speculum are almost indispensable. Decided preference is therefore given to the method of Sims as taught and practised by Emmet. The position of the patient and the use of the speculum are described in Chapter III.

3. *Direction of the Line of Union.* In order to decide upon the exact direction for closure, the edges of the fistula are approximated in different ways with tenacula, until that direction is found and adopted

FIGURE 379.



The proper area of denudation. The denuded surfaces correspond to the deck and the fistula to the manhole of a canoe. Left latero-prone position; exposure by Sims' speculum.

which permits the margins of the fistula to be approximated with the least traction. For reasons already given, it is always desirable to make the line of union, if possible, in the direction of the long axis of the vagina.

4. *Denudation.* The edges of the fistula are denuded by means of the tenaculum and scissors, as shown in Figure 378.

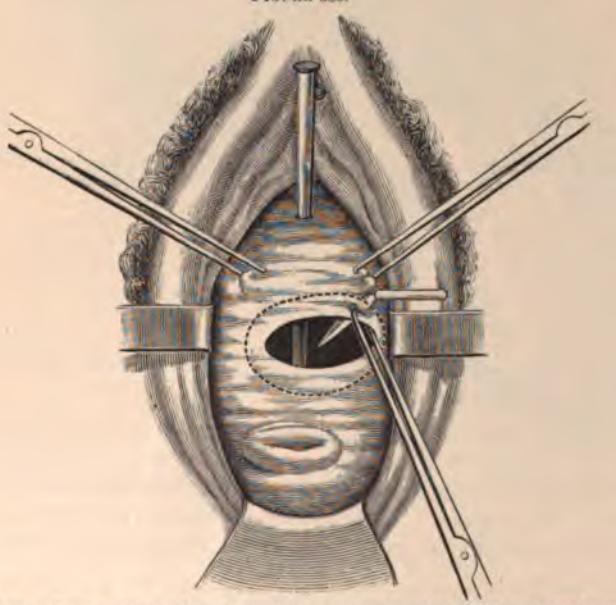
The skilful hand will denude superficially or deeply, as may be required. The denuded surfaces must be made clean and smooth; the

bleeding should be slight. For this purpose, the uterine tenaculum and scissors are far superior to the tissue forceps and the scalpel.

The margins of the fistula are seized with the tenaculum, at the point nearest the operator, and a strip is cut away all around the opening. It is highly important that broad surfaces be secured for approximation; hence it may be necessary to remove one or more additional strips around the opening. If the sloughing has left the edges about the fistula quite thin, the denuded surfaces should be broader. The two points upon which the greatest stress is laid are, first, adequate preparatory treatment; second, broad surfaces for union. The fistula may be so small as to be inaccessible for denudation, and may therefore have to be enlarged by incision in order that its margins may be freshened and united.

Instead of denuding, some operators split the edges of the fistula. This method, though not usual, is yet highly advantageous when the margins are thin, or when it is especially desirable to economize tissue. See Figures 382 and 383. The bladder mucosa, if cut, is prone to bleed freely; hence denudation should ordinarily extend to, but not into it. Hemorrhage from the cut bladder mucosa has even in the careful hands of Emmet, twice been so free as to distend

FIGURE 380.



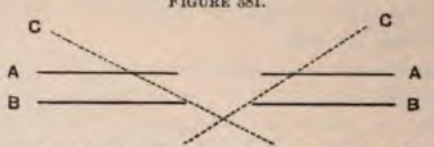
This cut is taken from a standard work, and shows how the denudation should *not* be made.

the bladder and endanger life. In both cases the sutures were removed and the bleeding points secured. When the denuded strip includes the bladder mucous membrane, the cut margin may retract into the bladder and make the bleeding points quite inaccessible. Complete anæsthesia, a strong light, good position, and the ski[illegible]

use of the speculum and uterine tenacula may then be necessary to evert and expose the bleeding surfaces and control the hemorrhage.

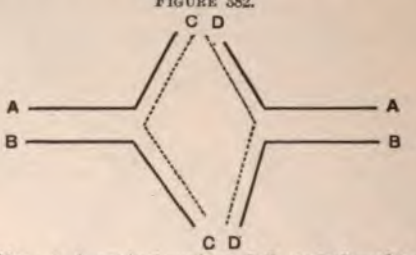
Emmet properly condemns the practice of simply denuding a strip of uniform width around on the vaginal side of the fistula. He insists that the margins be denuded to the vesical mucosa. The denudation at the angles of the fistula should, however, be extended some distance over the vaginal surface, as shown in Figure 379. Unless this is done, there will be a double fold or pucker at each angle. One may illustrate this by picking up together two small folds of a napkin, and observing that they extend a considerable

FIGURE 381.



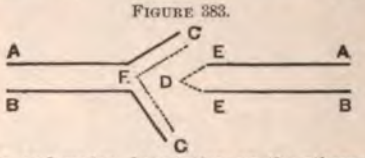
Bevelling of the edges: A, A, vaginal surface; B, B, vesical surface; C, C, lines of denudation.[1]

FIGURE 382.



Flap-splitting on both sides: A, A, vaginal surface; B, B, vesical surface; C, C, and D, D, inner surfaces of split edges, and the ones to be coapted.[1]

FIGURE 383.



Flap-splitting on one side and wedge denudation on the other: CFC and EDE are to be coapted.[1]

distance before they can be smoothed down to the common surface; so with the vaginal folds at the two ends of an improperly denuded fistula; the denudation must be so extended that the folds are lost on the level of the vagina. Unless this precaution is observed, union at the angles is apt to be imperfect, or at these points may fail altogether.

5. *Application of Sutures.* Formerly the metallic suture, usually silver, was almost exclusively used. Now, with aseptic methods, any suture is adequate. The writer prefers silkworm-gut tied on the surface with an ordinary hard knot. The numerous devices for fastening the sutures by means of short metallic plates, quills, split shot, and other means are useless, harmful, or unnecessary.

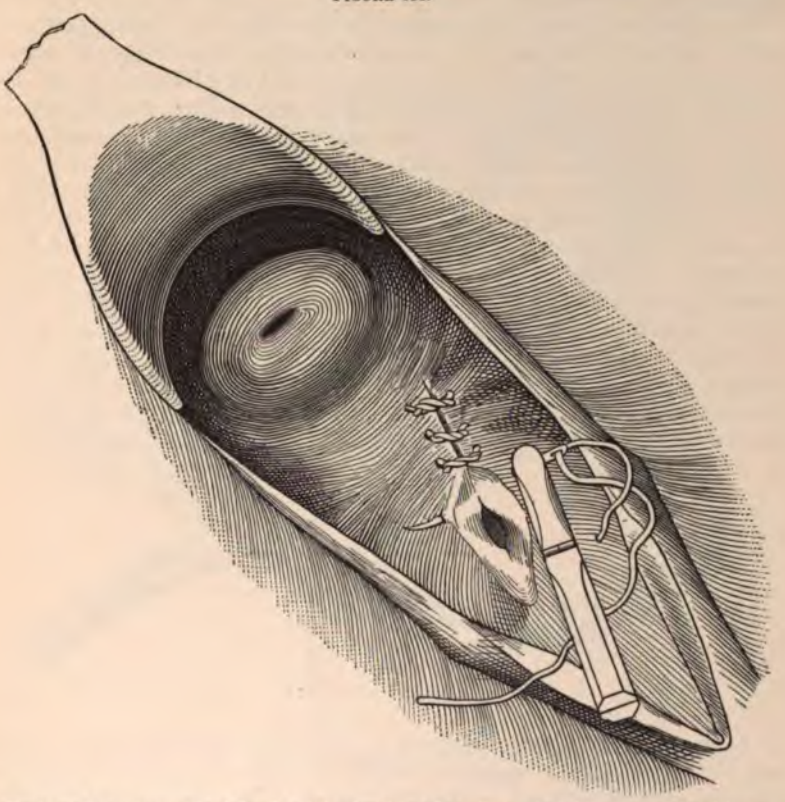
[1] Jenks, in American System of Gynecology.

Emmet's or Sims' needle is best adapted for ordinary use; it is short and straight, except near the point, where it is slightly curved. Occasionally a full-curved needle may be of service. The needle is shown in Figure 353.

A needle-forceps without locking handles will enable a dexterous operator constantly to vary the direction of the needle during its introduction, and is therefore recommended.

The suture should be attached to the needle in the ordinary way,

FIGURE 384.



Closing of a vesico-vaginal fistula: introduction of a suture. Left latero-prone position; exposure by Sims' speculum.

as a thread is attached to a common sewing-needle. The needle is grasped by the forceps and entered about one-eighth of an inch from the margin of the fistula on the vaginal side; it transfixes the vesico-vaginal wall and emerges on the bladder side, so as barely to include the vesical margin; it is then passed through the wall on the opposite side in the inverse order, and brought out one-eighth inch from the margin of the vaginal mucosa on that side. The sutures should be placed about one-sixth of an inch apart. If silver sutures are used, they should be all passed and then secured by twisting. In using

silkworm-gut, one should usually tie each suture as it is passed. Let the sutures be tied just tightly enough to hold the parts together. If tied too tightly, they strangulate the tissues, cut out, and fail to give union.

A clot of blood, if left in the bladder after closure, may cause great vesical tenesmus and possibly imperil the result. It is well, therefore, before tying the final sutures to throw a quantity of sterilized water through the urethra into the bladder. This water will pass through the fistula into the vagina and wash out anything remaining in the bladder.

6. *After-treatment.* The patient is placed on the back, with a roll under the knees for support. A self-retaining Sims' sigmoid catheter is placed in the urethra; it should be made of block-tin or of glass, bent by the flame of a spirit lamp. The curves may then be adjusted to the individual case. The urine passes through the catheter and is collected in a urinal placed between the thighs. The catheter is apt to become clogged with mucus or blood-clots, and should, therefore, be removed and cleaned every few hours. A second catheter is desirable, in order that one may always be introduced as soon as the other is removed. In case of a small fistula we may dispense with the self-retaining catheter altogether and permit the patient to pass the urine in the natural way. Both patient and nurse should be cautioned to see that the flow of urine is not interrupted. The catheter should remain about fourteen days. The sutures, unless removed earlier on account of suppuration or failure of union, may remain twelve days or two weeks. The woman should be kept in bed a week longer.

FIGURE 385.

Sims' sigmoid catheter.

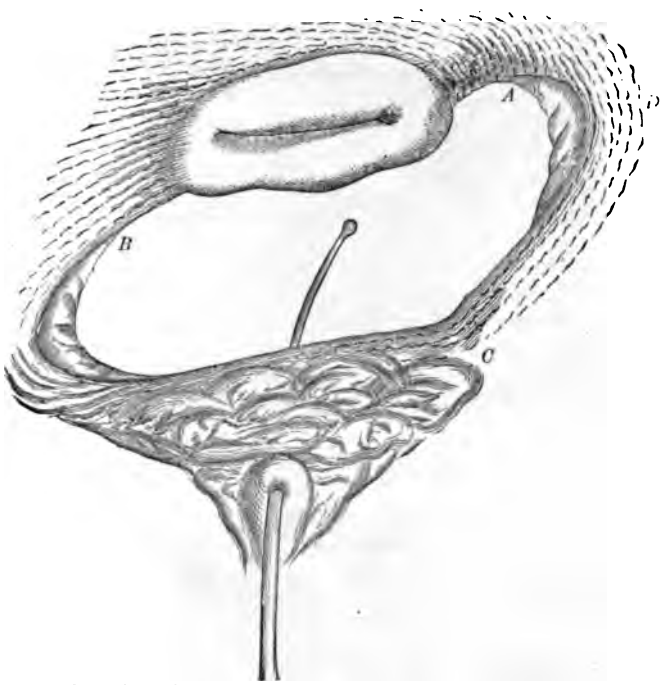
During convalescence reaction of the urine should be kept normal, otherwise phosphatic deposits may form in the line of union and on the sutures and prevent or destroy union. The benzoic acid mixture already described should therefore be continued. The long retention of the catheter and the continued dorsal position may give rise to great discomfort; hence the necessity in many cases of using more or less morphine, opium, or other anodyne. A cathartic should be given on the third day, and thereafter the bowels kept regular by moderate catharsis and enemata. After the final removal of the catheter there may be retention of urine, and it may be necessary, therefore, in order to prevent distention of the bladder, to draw the urine every few hours. In old cases the bladder, either from disuse or from cystitis, may be much contracted, and therefore liable to distention from a small quantity of urine. The functional powers of the bladder and

urethra progressively improve as the bladder gradually becomes accustomed to the retention of considerable quantities of urine. A bladder for many years contracted by vesico-vaginal fistula may regain its full capacity in a short time after closure of the opening.

Atypical Operations.

The ingenuity and skill of the operator will enable him to modify the operation according to the requirements of an atypical case. An operation may be only partially successful, and may have to be

FIGURE 386.



Fistula involving loss of entire vesico-vaginal septum as seen through the speculum.[1]

repeated again and again until the closure is complete, or it may be necessary to close the opening only in part at each one of several operations.

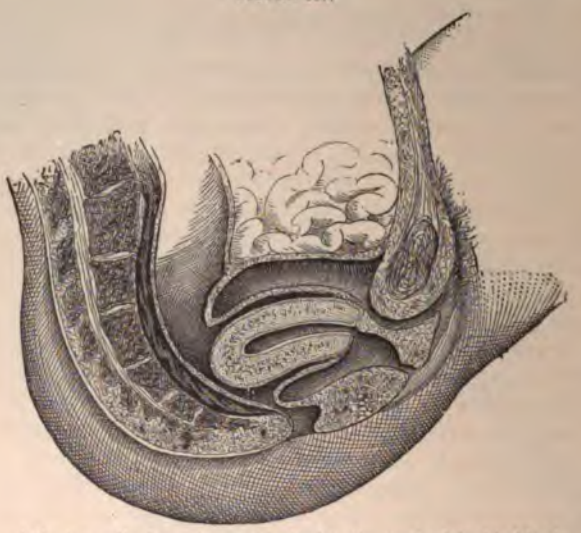
Loss of the Entire Vesico-vaginal Septum is usually associated with more or less destruction of cervical tissue and cicatricial development in the posterior vaginal fornix. The usual operation is to close by a transverse line of union—that is, to stitch the anterior lip of the cervix uteri to the neck of the bladder. In many cases the cervix is immovable and cannot be drawn down to the neck of the bladder until the post-cervical cicatrices have been freely divided by a deep transverse incision back of the cervix. In order to gain the re-

[1] Emmet. Principles and Practice of Gynecology.

quired reach, it may be permissible to split the cervix bilaterall
Figure 387 shows the fistula closed by union of the cervix uteri
the neck of the bladder.

So much of the anterior lip may have sloughed away as to rend

FIGURE 387.



Anterior wall of cervix uteri united to the neck of the bladder.[1]

FIGURE 388.

Uterus turned into bladder to secure retention. Points between *A* and *B* united. Anterior lip of cervix sloughed away. Uterus retroverted.[2]

[1] Emmet. Principles and Practice of Gynecology.

[2] Ibid.

its union with the neck of the bladder impossible. In such a case some operators turn the cervix uteri into the bladder by union of the posterior lip of the cervix to the neck of the bladder. This would establish a communication between the interior of the uterus and the bladder. Figure 357. A great risk from this operation is in the possibility that infection may pass from the endometrium to all the urinary organs or from the bladder to the uterus, Fallopian tubes, and even to the peritoneum. The chief danger, however, is that the operation is apt to form a pouch in which urine may stagnate, with resultant phosphatic deposit and incurable cystitis, only to be relieved by reopening the bladder and giving it drainage. See Artificial Vesico-vaginal Fistula for Cystitis. If the fistula be closed, so as to avoid the formation of such a pouch, cystotomy may be unnecessary; it is, unfortunately, too often impossible to avoid.

Kolpokleisis, or closure of the vagina, is an operation designed to secure retention of urine in cases of otherwise inoperable vesico-vaginal fistula. It is performed by denuding a wide strip all around the vaginal outlet just within the vulva and uniting the denuded surfaces upon themselves by means of interrupted sutures. The effect is to make one cavity of the bladder and vagina. This cavity receives the urine, menstrual blood, and uterine secretions. The operation always leads to inflammation more distressing than the condition for the relief of which it has been invoked. Emmet, in the strongest terms, condemns the operation and urges that it never be done in any case. He advises that the parts be made to heal with the opening unclosed, and that the patient be kept as comfortable without an operation as cleanliness and care can make her. The stagnant urine constantly present in the vaginal pouch formed by the operation always produces distressing—not to say dangerous—disease of the urinary organs.

The writer offers from his practice two instructive cases:[1]

Case I.—The injury in this case was more extensive than would ordinarily be repaired by plastic surgery. The cervix uteri to the level of the internal os, the vesico- and urethro-vaginal septum, and the recto-vaginal septum had entirely sloughed away; the perineum was completely lacerated through the sphincter ani muscle. The fundus of the inverted, ulcerated, and semi-strangulated bladder protruded through the pelvic outlet. This outlet was bounded by the sides of the vulva, by the posterior and lateral margins of the anus, and by the pubes. Thus all control of both urethra and anus was lost. The uterus was occluded by contracted cicatricial tissue and was full of retained menstrual fluid.

Clearly the conditions would discourage any effort at repair by ordinary methods. The problem was fourfold, and as follows:

To reopen the closed uterine canal and release the imprisoned menstrual fluid.

To replace the lost vesico-vaginal septum.

To replace the lost urethro-vaginal septum.

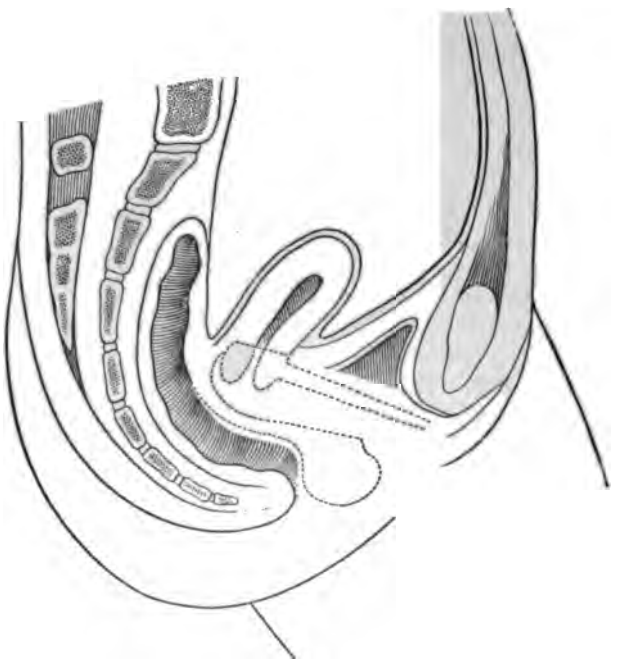
[1] Operations in the case of Mrs. G. A. M., at St. Luke's Hospital, Chicago.

To replace the lost recto-vaginal septum and reunite the sphincter ani muscle.

A free incision with sharp-pointed scissors into the uterus reopened the uterine canal and re-established normal menstruation.

The labia minora were much hypertrophied, and were therefore capable of supplying abundant material for the replacement of the lost vesico-vaginal wall; to this end, they, together with the adjacent tissue around and below them, were dissected off from above downward, but not detached at their lower ends. An area on each side just within the vulva, close to the margin of the bladder mucous

FIGURE 389.



The dotted lines indicate the parts destroyed by slough. The perineum was not destroyed, but was completely torn apart.

membrane, was freshened by denudation and splitting, and the edge of each corresponding labium was turned in and stitched to this area with silkworm-gut sutures. The flap thus formed on the right side united perfectly in its transplanted position; that on the left partly sloughed. The right transplanted labium now took its nutrition through the lower uncut end and the new tissues to which it was united. It was not possible, however, at the first transplantation to carry the labium sufficiently high to unite it with the upper margin of the fistula; it would not reach far enough to fill out the space left by the sloughed-out vesico-vaginal septum; in order to make it reach, the transplanting operation had to be done three times—that is, the labium was turned end for end upon itself three times,

and finally planted in place of the lost vesico-vaginal wall. One face of this labium was now the bladder side, and the other was the vaginal side of the restored vesico-vaginal wall. In order to maintain the nutrition of the flap during the period of its transplantation several months were allowed to intervene between the transplanting operations. Finally, after numerous attempts, in which sometimes a little was gained and sometimes nothing, the margins of the flap were united to the margins of the opening at every point and the integrity of the vesico-vaginal septum was restored.

The urethra was repaired by denuding two parallel strips, three-quarters of an inch apart, on either side of the urethral site, and uniting them one to the other by interrupted silkworm-gut sutures. This formed a new urethro-vaginal wall.[1] The remnant of the left labium minus was utilized in this part of the work. The urethra thus formed immediately gave a measurable degree of retentive power when the woman was lying down. The bladder, however, was much contracted from cystitis, and, having but small capacity, was at first of necessity often evacuated.

The recto-vaginal septum was replaced by drawing down the loose rectal wall from above into the gap, and after denudation uniting it to the lateral walls of the vagina with fine buried catgut sutures. At the same time the completely ruptured perineum, including the sphincter ani muscle, was reunited. The bowel and sphincter muscle at once resumed their normal functions.

Nineteen operations in all were performed before this result was reached.

The patient, two years after her discharge from the hospital, reported perfect control of the bowel and practically perfect control of the urethra. In a letter written at that time she said: "I have almost perfect control of the urine at all times; I say *almost* because of there being a slight weakness at times; but it is not often, and even then the *amount* of leakage is not great. I have taken up the study of shorthand, typewriting, and telegraphy, and if I make a success of it shall feel that my life has not been a failure."

This case, a curiosity in surgery, illustrates what may sometimes be accomplished by sustained effort; little by little, line by line, in the face of one discouragement after another, the work was done. The treatment continued over a period of more than two years, with an intermittent period of three years, when nothing was done. Most of the time it seemed like following the forlorn hope; now total failure, now a little success, until, finally, nineteen operations under anæsthesia had been done. Words fail to describe the bravery and patience displayed by this woman, or the difficulties and discouragements which the surgeon must meet in such a case.

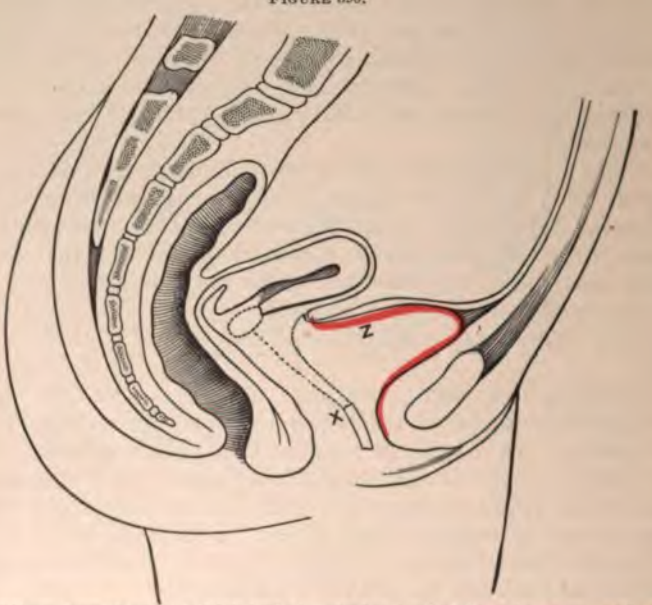
Case II.[2]—The entire vesico-vaginal septum, the vaginal portion of the cervix, and the anterior wall of the cervix to the internal os had sloughed away, leaving no bladder tissue between the inner extremity

[1] This is the operation proposed by Emmet. Principles and Practice of Gynecology. See chapter on Malformations.

[2] E. C. Dudley. Journal American Medical Association, March 27, 1886.

of the urethra and a point corresponding to the plane of the internal os uteri. See Figure 390. The upper and lower fragments of the opening could not be approximated—that is, the anterior wall of the uterus could not be approximated to the neck of the bladder after the method shown in Figure 387. The only operation which at first seemed possible was to unite the posterior wall of the cervix uteri to the neck of the bladder, as shown in Figure 388. This would have turned the cervix uteri into the bladder, and menstruation would have taken place through the urethra. But while this was under consideration it was found, on further examination, that the mucous membrane of the bladder, if caught with the tenaculum about an

FIGURE 390.



The dotted lines show the parts which had sloughed out. Red line shows remaining portion of bladder wall.

inch in front of the uterus, could be drawn to the neck of the bladder —that is, to the lower margin of the fistula, and held there without undue traction. A strip of mucous membrane across the bladder was therefore denuded from side to side an inch in front of the uterus. This denudation was continued around the lateral and lower margins of the fistula. The strip of denuded surface across the bladder was then drawn down and stitched to the lower margin of the fistula. Thus the bladder was divided into two parts, the upper closed part communicating with the urethra and receiving the urine from the ureters; the lower open part replacing the lost anterior vaginal wall. In other words, the part of the bladder wall, situated between the line of denudation across the fundus of the bladder and the uterus, was utilized as a substitute for the lost vesico-vaginal septum and anterior wall of the cervix. Twenty-two sutures were used. Not-

withstanding the failure of the nurse on the third day to keep the catheter in place, and the consequent accumulation of several ounces of urine in the bladder, union by first intention was complete. The bladder, although reduced in size by the operation, has normally performed its functions ever since. It is large enough to enable the woman to retain her urine all night. The writer is not aware that another similar operation has been recorded.

Howard Kelly suggests a plan which might be adopted to advantage in place of the one just described. It is to dissect the bladder entirely free from the uterus, so as to make a wide opening between the vagina and the peritoneum—that is, to make an anterior vaginal

FIGURE 391.

Section at × *Z* shows the fundus of the bladder stitched to the neck of the bladder.

section. The bladder-wall, anterior to the uterus, thus free from its uterine attachments, may then be drawn down so as to close the fistula by a transverse line of sutures.

Another possible method, suggested by Mackinrodt,[1] for such cases is to detach the vesical from the vaginal plate of the vesico-vaginal wall and to close the fistula by suturing together the vesical plate independently, leaving the vaginal plate open to heal by granulation. Figures 392 and 393.

VESICO-UTERINE FISTULA.

This form of fistula has already been mentioned on page 511, under Laceration of the Cervix ; it is the result of an anterior lacera-

[1] Centrablatt für Gynakologie, No. 8, 1894; from Kelly.

tion of the cervix extending into the bladder. Usually the effort of nature to repair produces union in the lower part of the laceration so as to repair the whole vaginal part of the injury and to leave the uterine part open. Figure 394 shows the sinus extending from the bladder, *B*, to the interior of the uterus, *A*.

FIGURE 392.

margins of fistula preparatory to approximating the fragments of the vesical plate of the vesico-vaginal wall.

The diagnosis is based upon the history of the case and the passage of urine through the os externum. The treatment is to reproduce the original tear by an incision through the anterior lip of the cervix which leads into the sinus. The fistula thus exposed at the angle of the laceration is denuded, and the whole wound, including the fistula and the cervical laceration, closed with silkworm-gut sutures. Since the sutures, in addition to closing the cervix, are also used to close the opening into the bladder, the operation does not

differ from the ordinary operation for closure of an anterior laceration of the cervix uteri.

URETHRO-VAGINAL FISTULA.

This form of fistula is sometimes intentionally made by a surgical operation in the treatment of urethritis and other diseases of the urethra; it is occasionally the result of ulcerative processes. If the

FIGURE 393.

Fistula being closed by union of vesical plate of the vesico-vaginal wall; this leaves the vaginal plate still open.

neck of the bladder is not involved, the functional power of the urethra to retain urine may be unimpaired. The operation for closure is the same as that described for vesico-vaginal fistula. The after-treatment consists of the hot-water douche twice daily. The

self-retaining catheter is not required. Ordinary catheterization is permissible, but, if the woman can pass urine without help, it is not required.

FIGURE 394.

Vesico-uterine fistula. *A*. Endometrium. *B*. Bladder.[1]

URETERO-VAGINAL FISTULA.

This form of fistula may be :

I. Congenital ; one or both ureters may open into the vagina.

II. Acquired.

Causes.

The causes of acquired uretero-vaginal fistula are :

1. Sloughing, due to pressure necrosis during labor.
2. Necrotic processes, due to malignant or specific disease.
3. Traumatisms, usually surgical.

Diagnosis.

The diagnosis is made by passing a ureteral catheter into the ureter at the point whence the urine escapes. In the congenital form there is no communication between the ureter and the bladder. The acquired form may or may not be associated with a vesico-vaginal fistula. If so associated, the ureteral opening is usually in the margin of the vesical opening. This combination is called a *uretero-vesico-vaginal-fistula*. If there is no vesico-vaginal fistula, the urine from one kidney only will escape through the vagina ; that from the other will pass naturally through the urethra.

Treatment.

The treatment of a uretero-vesico-vaginal fistula is as follows : First, split the uretero-vesical wall for a little distance back from the

[1] Emmet. Principles and Practice of Gynecology, second edition, p. 635.

margin of the vesical opening. This makes a new and larger opening for the ureter into the bladder remote from and out of the way of the vesico-vaginal fistula. The latter may then be closed in the usual manner.

If the uretero-vaginal fistula is not associated with a vesical opening, it should be converted into a uretero-vesico-vaginal fistula by an incision at the uretero-vaginal outlet directly through into the bladder. The operation is then continued as described above for a uretero-vesico-vaginal fistula.

Dudley Clamp Operation.

I present herewith the report of a unique case in which *stricture of the ureter was a possible result of laceration of the cervix uteri and uretero-vaginal fistula a result of trachelorrhaphy.*[1]

In this case a uretero-vaginal fistula occurred three days after introducing some rather deep sutures for the control of secondary hemorrhage following trachelorrhaphy. The ureteral bougie passed through a Nitze cystoscope demonstrated a tight stricture—possibly obliteration of the ureter near the opening of the fistula and between this opening and the ureteral orifice in the bladder. About one-half of the urine escaped from the left ureter into the vagina; the remainder passed naturally through the urethra.

About four weeks after the accident, with the purpose of performing some operation to re-establish a free communication between the injured ureter and the bladder, I again etherized the patient, and for more than three-quarters of an hour with uterine tenacula and a fine probe sought in vain for the point where the ureter opened into the vagina. No urine came through to mark this point, and even after some rather extensive dissection with the scissors I was unable to locate the fistula, nor was I able to make out the ureter by palpation. Finally, however, a little spurt of urine appeared just to the left of the cervix uteri, but I was unable at this point to pass even a very fine probe. Each attempt only resulted in the making of a false passage—a thing difficult to avoid under such conditions. I then made a colpocystotomy, cutting with the scissors through the vesico-vaginal wall in the median line and in the long axis of the vagina just in front of the cervix. The vesico-vaginal fistula thus made was an inch long. The upper extremity of it terminated close to the anterior wall of the cervix uteri. With a pair of straight scissors I then extended the incision upward and to the left as nearly as could be estimated to the point whence the urine had escaped. The object was if possible to convert the uretero-vaginal fistula into a uretero-vesico-vaginal fistula; so that the ureter should open, not into the vagina, but into the margin of a vesico-vaginal fistula. After another long search I again failed to find the fistulous opening into the ureter, until it was located by another spurt of urine, but the opening was again too small to admit a fine probe, and therefore could not be entered. I then still further enlarged the

[1] Boston Medical and Surgical Journal, volume cxlii. No. 9.

vesico-vaginal fistula in a direction to the left of the uterus, and by good fortune opened into a very much dilated ureter, from which immediately there gushed two or three ounces of pent-up urine. A bougie was now passed without obstruction to the kidney.

The situation being now much simplified, the following procedures were adopted: The bladder mucosa was stitched to the vaginal mucosa all around the artificial vesico-vaginal fistula. In this way the exposed surfaces were covered and hemorrhage controlled. A hæmostatic forceps, with handles about four inches long and with slender jaws about an inch long, was passed through the vesico-vaginal fistula. The forcep jaws were then passed, one into the ureter and the other into the bladder, so that the forceps when locked included in their bite, ureteral wall, bladder wall, and the connective tissue between. In this way the lower extremity of the cut-off ureter was clamped

FIGURE 395.

Author's operation for uretero-vaginal fistula.

into close relations with the bladder. The expectation was that the structures within the bite of the forceps would be destroyed by pressure necrosis, and that a wide, free, uretero-vesical opening would be established at a point somewhat distant from the artificial opening into the bladder, and that in this way the case would become one of uncomplicated vesico-vaginal fistula. The forceps came off in about three days, and twelve days later the vesico-vaginal fistula was closed by suture in the ordinary way. At the time of this operation the new ureteral orifice was found to be perfectly open and very patulous. The subsequent history was uncomplicated, union was complete, and in a short time the patient was discharged cured. In a letter written about six months after the final operation the

patient reported entire freedom from the pain in the left inguinal region from which she had suffered, and which had made her a semi-invalid for twenty years. I regret that the ureter was not explored before the operation on the cervix uteri, and that it has not been practicable to obtain measurements of it since.

My experience in the surgical treatment of uretero-vaginal fistula is limited to only two other cases, one traumatic and one congenital. In these two cases I operated at St. Luke's Hospital, Chicago, seven or eight years ago. The operative treatment in each was like that just described, except the ureteral and vesical walls were divided by scissors instead of being clamped by pressure forceps. In these cases, however, the ureteral openings were much nearer to the trigone, and the lower extremity of the injured ureter, therefore, was quite close to the bladder mucosa.

In the case just reported the distance and amount of tissue between the bladder and ureter was so great that it could hardly have been divided with the scissors without danger of uncontrollable hemorrhage or of the exposure of broad surfaces to reunite, or to cicatrize and contract, or to suppurate. These difficulties were obviated by clamping the ureter into close contact with the bladder, so that when the forceps came off, the exposed surfaces left by the necrosis would, owing to the compression, be of small extent. The compression forceps used in this way, therefore, may make the operation practicable in those regions where the tissue between the ureter and the bladder is too abundant to be divided safely by scissors.

It is hoped that this operation will give great security against subsequent stricture at the new ureteral orifice—a result not obtainable by any of the usual procedures.

Traumatic uretero-vaginal fistula as a result of trachelorrhaphy is rare, but as a result of vaginal hysterectomy and other vaginal sections is not of infrequent occurrence. The operation above described is applicable to the condition, whatever the cause, whether traumatic or congenital.

The alternatives to the operation are well known, and need not be described. To open the abdomen, sever the ureter and insert it into the bladder wall is an operation of great difficulty and danger, and sometimes is of only transient value. The same may be said of dissecting or stripping the bladder from the pelvic wall, finding the ureter and inserting it into the bladder, without invading the peritoneal cavity. The utilization of the vaginal mucosa in a plastic operation for the purpose of diverting the urine from the vagina to the bladder usually results in failure of union, or, later, in cicatricial contraction and consequent stricture at the ureteral orifice. The operation of switching the ureter into the intestine or into the opposite ureter is of very questionable propriety.

As a corollary to the case just described, the following observation, if well founded, may prove to have some practical significance. It is probable in this case that the laceration having extended into the parametria had torn the structures around the ureter. There may also have been injurious pressure of the presenting part of the child

against the ureter. Such lacerated tissues would necessarily heal by cicatrization and contraction, and the cicatrix thus formed would draw the bruised ureter toward the uterus, compress it, and so give rise to obstruction both from stricture and from kinking. Contracting cicatricial tissue extending from the cervix around the ureter would necessarily draw the ureter into closer proximity to the uterus, where a deep suture applied for closure of the cervix or to control bleeding would be apt to wound it, or by compression cause a narrowing of the lumen of that part lying within its grasp. In this case the stricture extended at least a half-inch on either side of the ureteral fistula. It was evidently this constricted portion of the ureter that was caught by the needle and cut off or penetrated by the suture.

It would be quite impossible, without further observation, to estimate the proportion of cases in which laceration of the cervix uteri causes stricture or kinking of the ureter. Every gynecologist may revert to a class of cases, not small, in which there is extensive laceration of the cervix uteri on one or both sides, and in which the localized pain dating from the puerperium is not readily accounted for by palpable lesions, and is not relieved in the slightest degree by the repair of the cervix. As I look back over an experience of more than twenty years I recall many such cases, and among them the one just reported.

But why, one may ask, if the ureter is often drawn by cicatricial contraction close to the uterus, is it not more frequently injured by operations on the cervix? The answer is that if the sutures of trachelorrhaphy were not usually introduced close to the uterus or very superficially in the vaginal wall, more cases of ureterovaginal fistula would probably be reported. This case was very hemorrhagic, and therefore required exceptionally deep sutures to control the bleeding. In view of the facts already set forth, I desire to submit two questions, as follows:

Question 1. In all cases of extensive laceration of the cervix uteri, in which the localized pain is not accounted for by palpable lesions, should we not pass a series of graduated ureteral bougies on the side corresponding to the laceration? This would be for the purpose of measuring the calibre of the ureter and of locating a possible stricture. The principles of examination would be similar to those of measuring the calibre of the male urethra in the diagnosis of stricture.

Question 2. In a case of ureteral stricture due to laceration of the cervix uteri, or to any other cause, and situated within the range of a vaginal operation, would not one be warranted in opening the bladder and then proceeding, as in the case reported, to establish a new ureteral orifice? In other words, should not that condition which in this case was the result of an accident, be deliberately reproduced in similar cases?

My answer to these questions would be in the affirmative.

Dr. Edward Reynolds[1] has reported a successful *case of the clamp operation by the method above described*. Cystoscopic examination after the recovery of the patient showed a ureteral orifice which, except the high location, presented all the appearance of the natural orifice.

[1] Boston Medical and Surgical Journal, January 24, 1901.

RECTO-VAGINAL FISTULA.

Causes.

Parturition, although a frequent cause, is relatively at least a less frequent cause of recto-vaginal than of vesico-vaginal fistula; the lesion is more frequently observed as the result of syphilis or cancer. Occasionally a peri-anal abscess is situated in the perineum, and in the acute stage breaks into both the vagina and the lower bowel; or, later, the perineum may be perforated from the anus to the vagina by the burrowing of pus. These cases are apt to be syphilitic or tuberculous.

Diagnosis.

The diagnosis is made by digital or speculum examination, or by injecting milk into the rectum and observing the point at which it appears in the vagina.

Prognosis.

The lesion, when due to cancer, is incurable; when the cause is syphilis, the operation for closure, unless preceded by adequate specific treatment, usually fails. A sinus of tubercular or other inflammatory origin should be successfully closed by suture; but the prognosis is much improved by such preliminary treatment as will improve the general nutrition. In fistula due to pressure necrosis the operation of closure by suture, although beset by more unfavorable conditions than in urinary fistulæ, usually succeeds.

Operation.

The principles are the same as for urinary fistulæ. The preparation is the same as for closure of the completely lacerated perineum—that is, free catharsis during several days before the operation, and the use of such food and intestinal antiseptics as will reduce to the minimum the amount of gas and other contents of the bowel; much depends upon making the bowel as nearly as possible aseptic.

The operation often fails from the pressure of gas and other rectal contents against the newly united wound; hence in order to give, during the healing process, a free outlet for the rectum, the sphincter ani muscle should be thoroughly and widely stretched.

The denudation and passage of sutures should be on the vaginal side of the recto-vaginal wall, and should extend to but not into the rectal mucosa. The object is to make the operation, so far as possible, in the more favorable soil of the vagina. In order to insure thorough denudation of the whole sinus clear to the margins of intestinal mucosa, the index-finger of the left hand in the bowel is made to roll the rectal margin toward the vaginal opening, and thereby render it accessible for denudation by means of the properly-curved scissors. In a very small fistula the sinus may be inaccessible for denudation until it has been made so by free incision on the vaginal

ision should not extend into the rectum. As in urin- d surfaces for union should be denuded on the vaginal thod of suture is the same as for vesico-vaginal fistula.

ANO-VAGINAL FISTULA.

inal fistula the sinus runs through the perineum, and be inaccessible for denudation. The sinus may then be opened by a perineal incision. This may be on the vaginal side, and need not necessarily divide the whole sphincter ani muscle. Most operators, however, divide the entire perineum between the sinus and the cutaneous side of the perineum. The remaining steps of the operation then are to denude freely and deeply the now exposed walls of the sinus, and then close the wound as in the operation for complete laceration of the perineum. The advantage of complete division lies in the immobilization of the muscle. Unless severed, it may, by its continuous relaxation and contraction, imperil union. As a corollary, it follows that if the muscle is not wholly divided, it should be partially divided or at least thoroughly divulsed. It is better to divide the muscle, or at least to divide all but a few fibres. The after-treatment is the same as for operations in urinary fistula and complete perineorrhaphy.

PART V.

DISPLACEMENTS OF THE UTERUS AND OTHER PELVIC ORGANS.

CHAPTER XLIV.

DISPLACEMENTS OF THE UTERUS.

General Considerations.

THE title of this chapter is not to be taken in a restricted sense, for the uterus is anatomically so connected with adjacent organs that the displacements of it cannot be intelligently considered nor satisfactorily presented without at the same time incidentally taking into account the displacements—causative, resultant, and concurrent—of the ovaries, Fallopian tubes, rectum, vagina, bladder, and perineum.

The following pathological sequence will serve as an example. The vaginal outlet may be so injured in labor as to cause a displacement of the perineum backward toward the coccyx, where it can no longer serve as a bulwark against the downward force which is exerted in the expulsion of the contents of the bladder and rectum. The force of straining at stool and of urination is now exerted against the less resisting bladder and rectal walls; they consequently pouch into the vaginal outlet. The downward displacements thereby produced are called cystocele and rectocele. The vaginal walls are attached to the uterus, and, being displaced downward, must, by traction, pull that organ to a lower level. The uterus in turn is connected with the bladder, rectum, Fallopian tubes, and ovaries, and in its own descent draws these organs out of place and disturbs their relation to one another. This shows how a uterine displacement may be both causative and resultant. Concurrent displacement of the uterus and other pelvic organs may result, for example, from the downward pressure of a tumor or from inflammatory causes.

It is convenient, because comformable to usage, to treat the subject of displacements of the pelvic organs under the heading Uterine Displacements. At the same time it must be held clearly in mind that a uterine deviation may not be the essential factor in the morbid sequence; on the contrary, it may, as already stated, be only an inci-

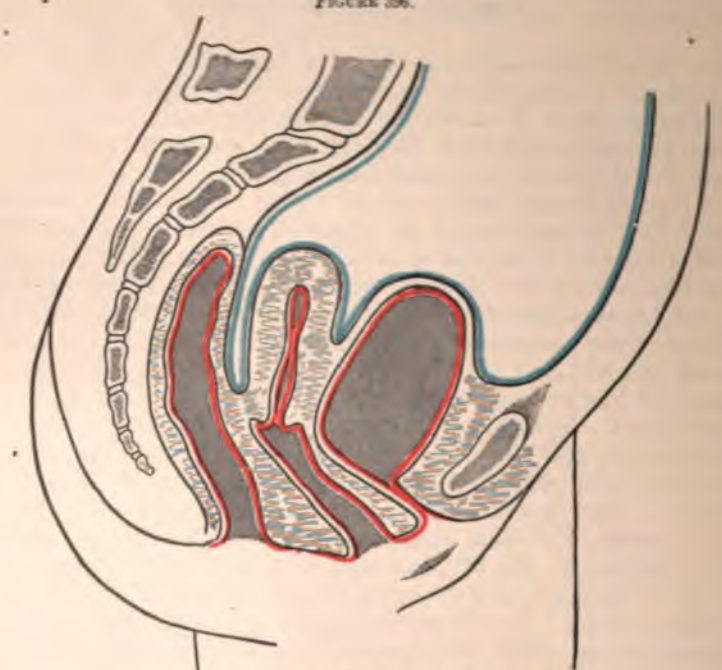
dent. The subject, therefore, properly includes the displacements not merely of the uterus, but of all the pelvic organs. It further embraces the relations which these displacements may bear to one another, and to such associated lesions as inflammation, tumors, traumatisms, and congenital defects.

The importance of a distinction between location and position will become apparent hereafter: by the former, is meant the situation of the organ regardless of its attitude; by the latter, is meant the attitude alone. To change an object from one place to another, is to change its location; to turn it over or bend it upon itself, is to change its position.

Normal Position of the Uterus.

In the works on anatomy and gynecology which we are accustomed to consult the uterus is represented as having a straight or nearly straight canal—as lying about midway between the symphysis pubis and the hollow of the sacrum, its axis corresponding to that of the pelvic inlet. These authorities generally agree that its position is one of slight, and only slight, anteversion; some admit that slight ante-

FIGURE 396.



Classical representation of the pelvic organs.

flexion may not be injurious, but most would pronounce the organ anteverted or anteflexed to a degree that would endanger health if by digital examination its anterior wall could be felt through the anterior wall of the vagina. This classical idea of the normal position of the

uterus wrongly presupposes a distended bladder and rectum occupying the anterior and the posterior thirds of the pelvic cavity. Such an arrangement would leave for the uterus only the intermediate space, and would constitute a condition seldom or never realized in health.

Suppose a straight line coincident with the vesico-vaginal wall, Figure 364, to be continued through the cervix to the sacrum. This line represents approximately the antero-posterior diameter of the pelvis. The length of the vesico-vaginal wall is two and a half inches, and, supposing the cervix to be just midway between the symphysis and the sacrum, the distance from its posterior wall to the sacrum must also be two and a half inches. Add to the sum of these two parts of this antero-posterior diameter one inch for the cervix, and the antero-posterior diameter of the pelvis becomes six inches, instead of the normal four and one-third, which proves that the cervix must normally be much nearer to the hollow of the sacrum than to the symphysis. Since the length of the vesico-vaginal wall plus the diameter of the cervix measures three and one-half inches, it follows that the distance from the posterior wall of the cervix to the hollow of the sacrum must be the difference between four and one-third and three and one-half inches, or five-sixths of an inch. These measurements are approximations.

Again, suppose the uterus, Figure 396, to be carried bodily upward and backward, its axis remaining the same, until the cervix reaches its normal position near the hollow of the sacrum; then would the body of the uterus impinge upon the bony sacrum. It is therefore clear that anteversion must be the normal position, because the uterus and sacrum would otherwise occupy the same space.

Figure 365 represents, according to Schultze,[1] the location and position of the virgin uterus and its surroundings—the bladder, rectum, and vagina being empty and collapsed. The angle of about 90° which the cervix forms with the vagina measures the forward inclination of the cervix, but is subject to slight variations in consequence of the physiological movements of the uterus. The body is furthermore bent forward upon the cervix, so that its anterior surface rests upon the empty bladder. The angle of normal anteflexion, according to careful measurements by Schultze, is about 48°; Fritsch says that 90° is the physiological limit. This question will be further considered under the subject of pathological anteflexions.

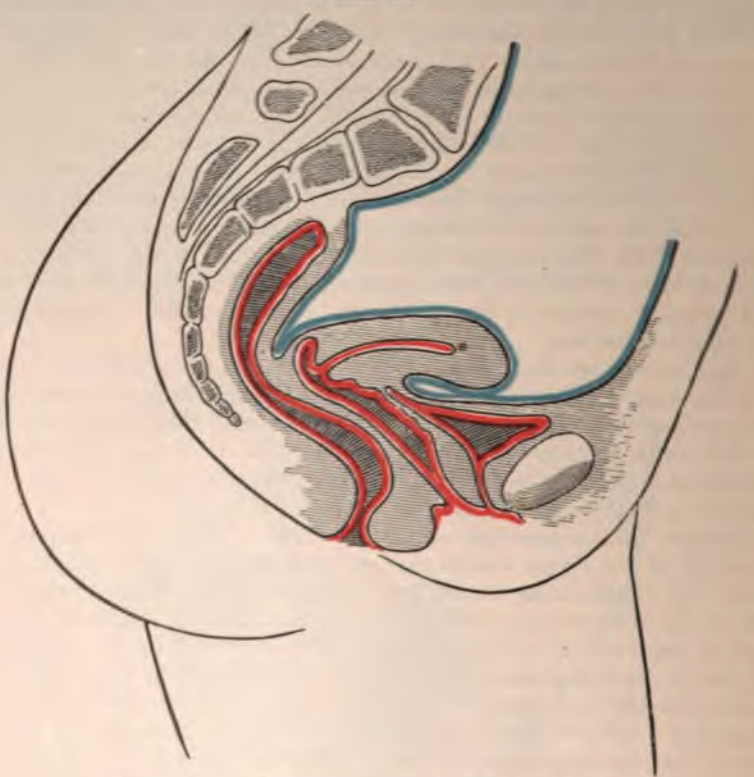
Normal Movements of the Uterus.

Strictly, the uterus can have no absolutely normal position or location, because it has a certain normal range of movements that depend to some extent upon respiration, intra-abdominal forces, and locomotion, but more especially upon the varying quantity of the rectum and bladder contents. The normal position, then, varies within the

[1] Archiv für Gynäkologie, 1875, Band viii. p. 134, and Lageveränderungen der Gebärmutter, Berlin, 1881. Ely Van de Warker makes a full and critical study of the normal movements of the unimpregnated uterus, in the New York Medical Journal, vol. xxi. p. 337; and of the normal position and movements of the unimpregnated uterus, in the American Journal of Obstetrics, vol. xi. p. 314. His conclusions substantially agree with the later observations of Schultze.

limits of the normal movements. If the body of the uterus rests upon the bladder, it must rise as the bladder becomes distended; and, conversely, if the urine be drawn through a catheter while the woman is lying on her back, the uterus, notwithstanding the opposing influence of its own weight, immediately follows the receding wall of the bladder and returns through an arc of 45°, or possibly even 90°, to its accustomed position.

FIGURE 397.



Correct drawing of the pelvic organs. Semi-diagrammatic.

The full rectum forces the uterus in the opposite direction, toward the symphysis, and thereby counteracts the influence of the full bladder. This anterior movement is, however, somewhat limited, and is confined to the cervical portion, except when the body has been forced back into close proximity with the rectum by the over-distended bladder.

Normal Supports of the Uterus.

The uterus is maintained in its normal position and location by the pelvic floor, of which the uterine ligaments are an essential part.

The uterine ligaments are physiologically in a state of relaxation;

the state of tension would be pathological; they do not fix the uterus; they tend only to limit its movements to their normal range. Backward displacement of the body is resisted by the round ligaments; backward displacement of the cervix, by the utero-vesical ligaments and by the vesico-vaginal wall. Forward and downward displacements are resisted by the utero-sacral ligaments, and excessive lateral motion by the broad ligaments. This restraining power is doubtless greater in the utero-sacral than in any of the other ligaments.

The pelvic floor,[1] which is the chief support of the uterus, is divided into two segments, the pubic and sacral.[2] The pubic segment includes bladder, urethra, anterior vaginal wall, and bladder peritoneum; it is attached in front to the symphysis pubis, and laterally to the anterior bony walls of the pelvis. The sacral segment includes rectum, perineum, posterior vaginal wall, and strong tendinous and muscular tissue; it is attached to the coccyx, to the sacrum, and to the posterior wall of the bony pelvis.

Permeating the pelvic floor in all directions, entering into the composition of its single parts, binding them together, and sending its processes to the bony pelvis, is the pelvic connective tissue, upon the integrity of which largely depends the integrity of the pelvic floor as a uterine support. Its pernicious influence when diseased is considered elsewhere. The idea that the uterus is supported by the vaginal walls, or by the perineum, or by the uterine ligaments is obsolete; they are important parts of the pelvic floor and as such contribute their share, but the pelvic floor as a whole supports the uterus. The various uterine supports are to a great extent the seat of motor influence. They consequently not only resist excessive movement, but also serve to return the organ from its physiological migrations.

Definition and Nomenclature of Displacements. In the foregoing pages the normal location, position, movements, and supports of the uterus have been outlined. Those conditions are pathological which induce changes to positions or locations beyond the defined limits, or which so fix the organ that its normal movements are prevented. The displacements are divided into mal-locations and malpositions.

The mal-locations, in which the uterus occupies a place outside its normal limits, are as follows:

Ascent.	Ante-location.
Retro-location.	Lateral location.
	Descent.

The malpositions are determined by excessive change in the inclination of the uterine axis. They are further divided into flexions, in which the organ is bent upon itself in an abnormal degree, manner, or direction; and versions, in which the axis of the unflexed uterus inclines in an abnormal degree or direction. The malpositions therefore are:

Retroversion.	Lateral flexion.
Retroflexion.	Anteversion.
Lateral version.	Anteflexion.

[1] For a description of the female pelvic floor, see Hart's Atlas.
[2] Hart and Barbour's Manual of Gynecology.

Symptoms and Diagnosis of Displacements in General.

Each variety of displacement may be indicated by its own group of symptoms and physical signs. These will be presented in the study of special displacements. To avoid repetition, those symptoms and signs which pertain to no special displacement, but which belong to all alike, will be mentioned at once. They may arise either from the displacement itself or from its possible complications, of which the following are examples: metritis, ovaritis, salpingitis, atresia, stenosis, cystitis, vesical catarrh, rectitis, rectal catarrh, perimetritis, peritonitis, uterine catarrh, tumors, and cicatrices.

Uterine displacement may be a cause or an effect of associated complications; or, together with them, it may be a concurrent result of some common cause; or it may have had primarily no pathological connection with them. The symptoms of displacement refer to the pelvic organs or to the nervous system. Among the symptoms which refer to the pelvic organs are difficulty in walking and standing, pelvic pain, more or less constant; dysmenorrhœa, menorrhagia, sterility, frequent abortion, constipation, painful or difficult defecation, dysuria, polyuria and tenesmus. Among the symptoms which refer to the nervous system are, neuralgia in various parts, paralysis, hysteria, nervous dyspepsia, anæmia, chlorosis, and spinal irritation.

The final diagnosis must always depend upon direct examination of the uterus itself. The first division of the above group of symptoms is not likely to escape notice as indicative of displacement, but the nervous symptoms are constantly disregarded or treated without reference to their possible pelvic origin. The frequent dependence of these nervous phenomena upon displacement is proved by their persistence in many cases after ordinary treatment, by their prompt disappearance upon permanent replacement and retention of the uterus by mechanical means, and by their usually prompt recurrence upon removal of the support. The presence, therefore, of the second division of the group, or any part thereof, even though the first be absent, will justify—nay, even necessitate—a careful investigation into the state of the pelvic organs.

The examination that results only in giving the name to a special variety of displacement, and does not include the complicating lesions, would not furnish a sufficient guide to the therapeutic indications, and is therefore inadequate. The successful treatment, for instance, of an anteflexion dependent upon inflammation of the utero-sacral ligaments must include the removal of the inflammation.

An important prerequisite to examination is the absence of contents in the rectum and bladder. The full rectum distorts the vaginal walls, deprives the examiner of the space necessary for the introduction of the speculum, and throws the uterus out of its accustomed position. Much more troublesome is the presence of even a small quantity of urine in the bladder, because it causes the patient to render the abdominal muscles tense when the hand is placed over the lower portion of the abdomen for bimanual palpation, and makes it impossible to engage the uterus between the hand and the examining finger. The

distended bladder, by pushing the uterus upward and backward, makes bimanual palpation almost useless. It is not surprising that conflicting opinions are common, when one day the patient is examined with rectum and bladder full, another day with these organs empty; one day in the dorsal, another day in Sims' or the knee-chest position; one day with the cylindrical or bivalve speculum, another day with Sims' or Simon's. The left-hand method of examination is incomparably superior to the right. The palmar surface of the index-finger is more easily directed toward the left side of the pelvis, which is especially subject to disease. Its tactile sense is more acute and more easily educated. The stronger right hand should be free to palpate the surface of the abdomen in conjoined manipulation.

For digital examination the dorsal position is preferred: the patient should be drawn close to the edge of a bed, or preferably a table, the thighs being flexed, the feet about fifteen inches apart, and knees widely separated. The examiner should stand facing the patient or at her left side. The index-finger of the left hand, properly lubricated, then slowly advances over the perineum into the vagina, noting the condition of the perineum, the presence or absence of cicatrices, lacerations, tumors, or relaxation of the vagina or perineum, the capacity of the vagina, the condition, size, and direction of the cervix, its distance from the sacrum and vulva, its mobility or fixation. Now, the right hand is pressed well down behind the pubes, and the uterus is engaged between it and the examining finger. See Chapter III. In this way the examiner may determine quite accurately the position, location, and size of the entire organ; may detect the possible presence of complicating tumors, both inflammatory and non-inflammatory; may also note, if possible, the location and condition of the ovaries, which, especially in posterior displacements, are liable to be prolapsed and excessively sensitive, and to constitute, therefore, a most intractable complication. The index-finger sweeps around the cervix in search of tender places which may be the result of inflammation or the expression of some neurosis. Above all, the digital examination requires a light, gentle, delicate touch. The index-finger may now be removed and reintroduced into the rectum, the right hand still being behind the pubes, or the cervix may be grasped between the index-finger in the rectum and the thumb in the vagina, picked up, as it were, between the finger and the thumb thus placed, and with the aid of the right hand behind the pubes thoroughly palpated.

Adequate diagnosis of the position of the pelvic organs is usually made by touch and conjoined palpation. It is seldom necessary or desirable to sound or probe the uterine cavity in order to learn the position of the uterus; indeed, accurate information in the majority of cases can be more readily and more safely gained by touch alone. A tumor or inflammatory mass in the pelvis may be confused with the uterus. In such a case the uterus may be definitely located—relative position determined—by the sound or probe. When the uterine canal is thus explored the patient may be on her back, and

finger in the vagina may be used as a guide. The wever, is most effectually and gently made with Sims' atient being in the left latero-prone position. In some cannot be passed by any other method. The bivalve specula are almost useless in explorations of the inte- us.

CHAPTER XLV.

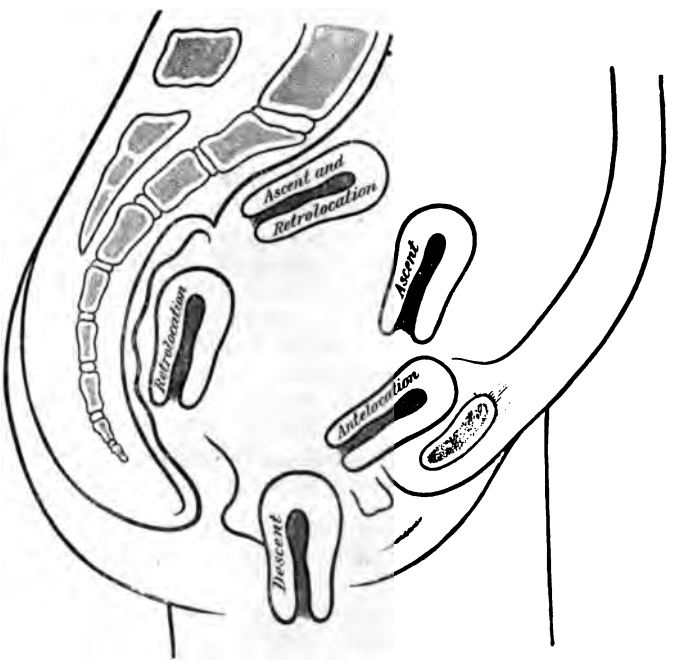
MAL-LOCATIONS OF THE UTERUS.

Ascent. Retro-location. Ante-location. Lateral Locations. Descent or Prolapse.

ASCENT.

ASCENT of the uterus may result from traction above or pressure below. The organ may be drawn upward and backward by shorten-

FIGURE 398.



Schematic drawing of various mal-locations.

ing of the utero-sacral ligaments, which results from inflammation, and which usually induces a troublesome form of anteflexion. The enlarged pregnant uterus sometimes becomes attached by adhesive inflammation to a portion of the peritoneum in one of the higher zones of the pelvis or in the abdomen, and the organ may consequently remain fixed in its elevated position after involution. A tumor connected with the uterus or its appendages which has grown

too large to be retained in the pelvis may, upon rising into the abdomen, drag the uterus with it. Pressure below may come from excessive distention of the rectum or bladder, or from a large accumulation of menstrual fluid in the vagina, or from a tumor originating in any portion of the pelvis below the level of the uterus.

RETRO-LOCATION.

The uterus may be forced back into a post-normal location by the presence of a tumor in front or by the distended bladder, or it may be drawn back and fixed by peritoneal adhesions. Retro-location is liable to induce vesical irritation by putting the vesico-vaginal wall on the stretch, and thereby dragging on the neck of the bladder.

ANTE-LOCATION.

The causes of this displacement are similar to those which produce retro-location; they are: Distention of the rectum, post-uterine hæmatocele, post-uterine tumors, and peritoneal adhesions. Ante-location often causes vesical irritation, consequent upon the invasion by the uterus of that space which belongs to the bladder.

LATERAL LOCATION.

The entire uterus is often displaced to the right or to the left by a tumor or by an inflammatory mass. In either case the uterus is crowded to the opposite side of the pelvis. After resolution of an inflammatory mass the broad ligament and adjacent inflamed structures, shortened by cicatricial contraction, draw the uterus to the affected side and fix it there. Laceration of the cervix opens the way to infection, and is often therefore followed by inflammation in the parametrium on the corresponding side. The uterus may be crowded to one side by a tumor.

Diagnosis, Symptoms, and Treatment of Ascent, Retro-location, Ante-location, and Lateral Location.

The diagnosis, symptoms, and treatment of the above mal-locations are wholly subordinate to the more significant lesions of which they are only the incidental results.

The Treatment for mal-locations due to inflammatory causes is the same as that for the inflammation. The indications for topical treatment and surgical measures, including operations on the uterus and its appendages and the removal of tumors, will vary with the causative lesions. In many cases mal-locations of the uterus give rise to no symptoms, and therefore require no treatment. Pessaries for all mal-locations except descent are useless, and may be harmful.

DESCENT OR PROLAPSE.

The nature of this displacement is clearly indicated by the name. It is convenient to distinguish three degrees of descent:

FIRST DEGREE: The uterus is displaced downward until sufficient space has been gained between the cervix and the sacrum to permit the corpus to turn back into extreme retroversion.

SECOND DEGREE: The cervix descends to the vulva.

THIRD DEGREE: The uterus protrudes partially or wholly through the vulva. The third degree of descent is sometimes called procidentia.

Etiology and Mechanism of Descent.

Descent may be the result of any or all of the following causes:[1]

1. Pressure from above.
2. Weakening of the uterine supports.
3. Increased weight of the uterus.
4. Traction from below.

Any of the above conditions being the primary cause, the others singly or combined may result.

1. PRESSURE FROM ABOVE. Under this head may be included:
   - *a.* Pelvic or abdominal tumors.
   - *b.* Ascites.
   - *c.* Tight or heavy clothing.
   - *d.* Straining at stool.
   - *e.* Muscular exertion.
   - *f.* Fecal accumulations.
   - *g.* Habitual overdistention of the bladder.

2. WEAKENING AND RELAXATION OF THE UTERINE SUPPORTS may be consequent upon:
   - *a.* Subinvolution.
   - *b.* Senile atrophy of the pelvic floor.
   - *c.* Abnormally large pelvis.
   - *d.* Increased weight of the uterus.
   - *e.* Puerperal traumatisms.
   - *f.* Pressure from above.
   - *g.* Traction from below.

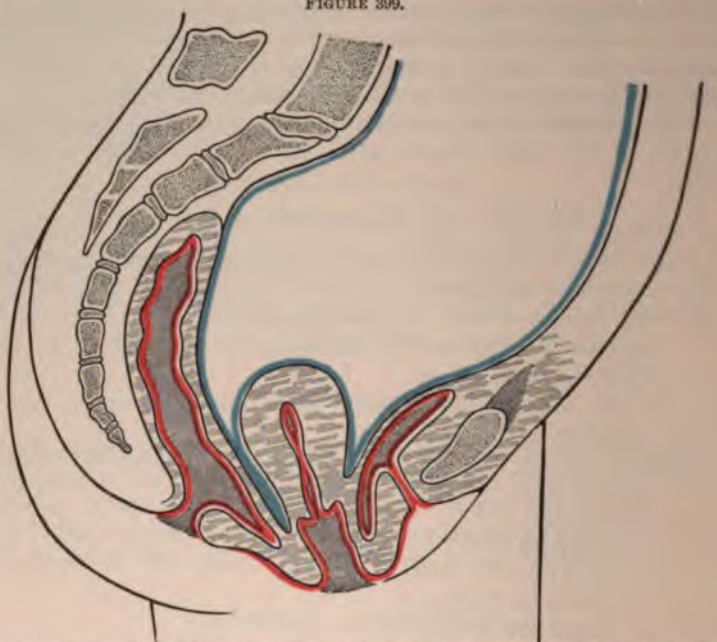
3. INCREASED WEIGHT OF THE UTERUS. Among the pathological developments which cause increased weight are:
   - *a.* Congestion.
   - *b.* Subinvolution.
   - *c.* Metritis.
   - *d.* Pregnancy.
   - *e.* Fluid in the endometrium.
   - *f.* Uterine tumors.

4. TRACTION FROM BELOW may be due to such causes as:
   - *a.* Vaginal cicatrices.
   - *b.* Abnormally short vagina.
   - *c.* Falling of the pelvic floor.
   - *d.* Contraction and congenital shortening of the vagina.
   - *e.* Tumors of the cervix or vagina.

Utero-gestation, parturition, and the puerperium may be followed by increased weight of the uterus and weakening of the supports from

[1] Adapted from Thomas' Diseases of Women.

FIGURE 399.



Uterus between first and second degrees of descent. Rectocele and cystocele. Semi-diagrammatic.

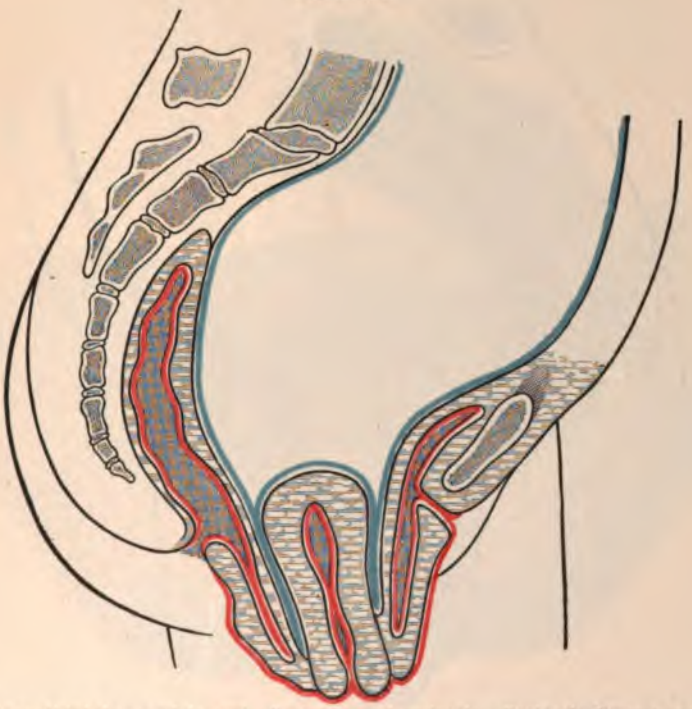
FIGURE 400.

Second degree of descent. Cervix appears at the vulva. Rectocele and cystocele. Semi-diagrammatic.

subinvolution. Puerperal traumatism may injure the vaginal outlet and cause the vaginal walls to fall; these in turn may drag the uterus down after them; indeed, excessive descent of the vaginal walls usually originates in parturition. Obviously, descent of the vesico- and recto-vaginal walls, or, more comprehensively, the sacral and pubic segments of the pelvic floor, involves also concurrent descent of the uterus and its appendages. It is clear from the above that descent of the vagina must be studied in connection with the descent of the uterus.

In labor the anterior wall of the vagina is so depressed, stretched, and shortened by the advancing head of the child that during and after

FIGURE 401.



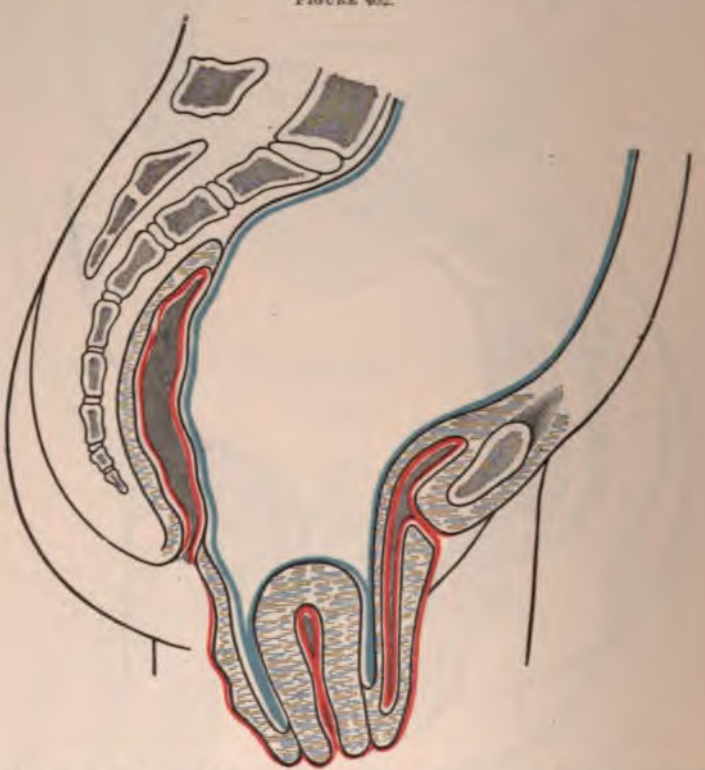
Complete or third degree of descent. Rectocele and cystocele. Rectocele forms a pouch in which scybalæ may accumulate. Semi-diagrammatic.

the second stage the anterior lip of the cervix may be seen behind the urethra. If the puerperium progresses favorably, with prompt involution of the uterus, vagina, perineum, and peritoneum, the relaxation of the vesico-vaginal wall and of the utero-sacral supports disappears and the uterus resumes its normal multiparous location and position. But if the enlarged uterus remain in the long axis of the vagina, with its fundus incarcerated in the hollow of the sacrum between the utero-sacral ligaments, and with its sacral supports so stretched that they cannot recover their contractile power, and with involution of all the

pelvic organs arrested, the descent may not only persist, but may even progress, with constantly increasing protrusion of the vesico-vaginal wall—*cystocele*—to the third degree of prolapse. The downward influence of the above conditions may be increased materially by rupture of the perineum and consequent prolapse of the recto-vaginal wall into a pouch, called *rectocele*.

In the great majority of cases of complete prolapse the posterior vaginal wall in its descent is peeled off from the rectum, as shown in Figure 402, leaving the latter in the normal position. In rare instances the lower portion of the rectum also is found to have extruded in

FIGURE 402.



Complete or third degree of descent. Vaginal wall peeled off from the rectum, leaving the rectal wall in normal position. Cystocele extreme; no rectocele. Semi-diagrammatic. Bladder displaced with the uterus. See Figure 404.

extreme rectocele, making a pouch below and in front of the anus, in which fecal matter may accumulate and remain as hard scybalæ. See Figure 401.

Obviously, complete prolapse of the uterus is only an incident to prolapse of the pelvic floor. The whole mechanism is in all respects analogous to that of hernia. The extruded mass drags after it a peritoneal sac, which, hernia-like, contains small intestine. This sac forces its way to the pelvic outlet and extrudes through the vulva, having the inverted vagina for a covering.

In the first degree of descent, Figure 408, as we have said, the uterus is displaced downward and forward sufficiently to permit the body to turn back into retroversion; as already stated, the organ in its normal location cannot retrovert, because in so doing it would impinge upon the bony sacrum. As a consequence of the first degree of descent there are two significant possibilities: *First*, as the uterus falls to a lower level, where it would crowd upon and irritate the bladder, its long axis usually changes so as more and more to conform to that of the vagina, the cervix moves toward the pubes, and the corpus toward the sacrum—that is, it turns back away from the bladder into retroversion; this is as if the irritated bladder, in the protection of its own rights and territory, had thrown it back;

FIGURE 403.

Prolapse of the third degree. Uterus protruding through the vulva. Sounds demonstrate the bladder to be in complete descent with the uterus.[1]

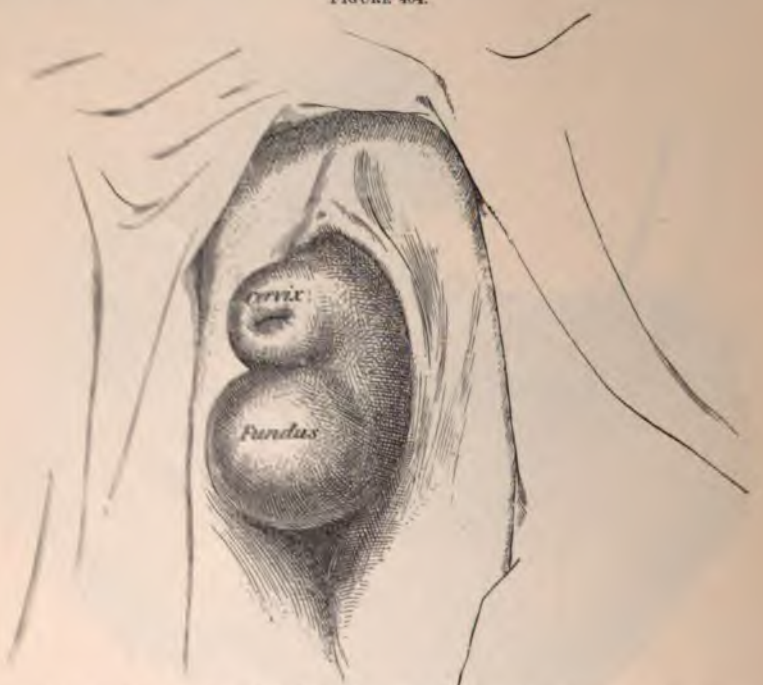
second, instead of turning back into retroversion, the location of the uterus may simply change to a lower level, while the position remains the same—that is, the organ, still retaining its normal position of anteversion and anteflexion, may only settle to a lower plane. It must then occupy space that belongs to the bladder. The normally anteverted and anteflexed uterus in such descent is much more palpable to digital examination, and for this reason the vesical irritation consequent upon the descent has often been wrongly attributed

[1] After Schaffer.

to the anteversion and anteflexion. In this way has arisen much confusion in the effort to draw the line between normal and pathological anterior positions. The prompt relief which follows permanent replacement of the organ to the normal location, even though in so doing the anteposition be exaggerated, proves that such symptoms depend upon the mal-location, not upon the anteposition. The importance of a clear distinction therefore between location and position becomes now apparent.

Another cause of vesical irritation is the dragging of the uterus upon the neck of the bladder. This traction occurs not only in ascent, but also when the organ descends below a certain level.

FIGURE 404.



Prolapse of the third degree. Retroflexed uterus protruding through the vulva. Fundus covered by the posterior vaginal wall.

In the foregoing paragraphs traction due to the falling pelvic floor has been discussed as a cause of descent. The impairment of the uterine supports may, however, be such that, instead of falling and dragging the uterus after them, they simply permit it to descend along the vaginal canal by the force of its own weight, and to carry with it the reduplicated vaginal walls. This influence is generally enforced by the increased weight of the diseased organ. The vagina more readily becomes a track for the descending uterus when from any cause the normal forward direction of the vaginal canal changes toward the vertical; this change in the direction of the vagina may occur either as the result of forward displacement of its upper ex-

tremity or of a retrodisplacement of its lower extremity. The former involves anteposition of the cervix; the latter, backward displacement of the perineum. For a full discussion of backward displacement of the lower part of the vagina and vulva toward the coccyx, see Lacer-

FIGURE 405.

FIGURE 406.

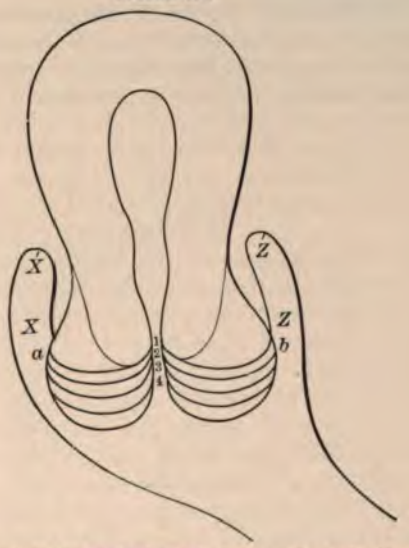


Figure 405.—Descent of the virgin uterus into the vaginal canal, showing the reduplicated vaginal walls. The utero-vaginal attachment, points *X* and *Z*, appears to be at *X'* and *Z'*. The apparent increase of length in the vaginal portion of the cervix, due to the reduplication, is measured by the distance from *X* and *Z* to *X'* and *Z'*.

Figure 406.—Descent of the uterus, showing excessive circular enlargment of the lacerated cervix, consequent upon reduplication of the vaginal walls and out-rolling of intracervical tissues. The divided fragments of the os externum are at *a* and *b*. The curved lines forming the angles 1, 2, 3, and 4 indicate the gradual process of the eversion. The angle of the laceration originally at point 1 has been forced down by the swelling and out-rolling of the mucous and submucous tissues of the cervix to point 4. The apparent os externum is at point 4. The utero-vaginal attachment *X* and *Z* seems to be at *X'* and *Z'*. The vaginal portion of the cervix therefore appears much larger and longer than it actually is.

ation of the Perineum and Injuries to the Pelvic Floor, in Chapters XL. and XLI. When the uterus descends along the track of the vagina, the long axes of the two organs will correspond; hence, such descent must involve a degree of retroversion. See Figure 408.

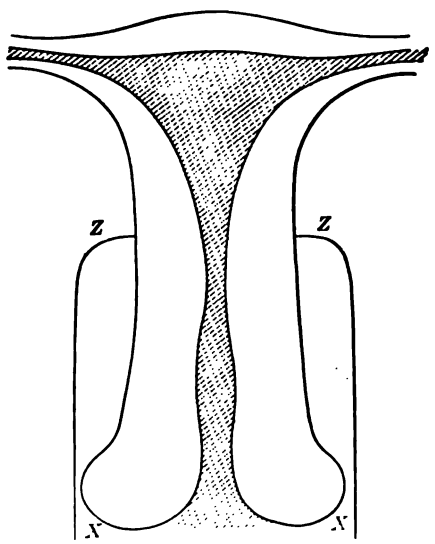
Pathology.

The pathology may involve all the displaced organs. The circulation throughout the pelvis is impeded by traction upon the vessels; the entire pelvic contents therefore become the subject of venous congestion, with consequences disastrous to local innervation and nutrition. The ovaries and Fallopian tubes suffer concurrent displacement. That portion of the peritoneum which enters into the formation of the uterine ligaments and of the pelvic floor is dragged along with the uterus. The vagina, also displaced, may become hypertrophied, swollen, and inflamed.

Sometimes the cul-de-sac of Douglas is distended by downward pressure of the intestines, by a small tumor, or by ascitic fluid, and a consequent hernial sac may protrude into the vagina through some portion of the posterior vaginal fornix. The anterior fornix is subject to a similar accident. These conditions are designated *enterocele vaginalis anterior* and *posterior*.

In the third degree of descent the vagina, now rolled out and exposed to external conditions, is no longer lubricated and protected by normal secretions, and therefore becomes dry, parchment-like, œdematous, eroded, and perhaps ulcerated.

FIGURE 407.



This cut is from a part of an illustration in a standard text-book. It is reproduced to illustrate the current misconception of complete prolapse and apparent elongation of the cervix. The apparent elongation almost invariably disappears on replacement of the uterus. The appearance of elongation is due to congestion and vaginal reduplication. Amputation of such a cervix, so often advised, would be apt to involve the bladder in front and the cul-de-sac of Douglas behind. Actual elongation of the cervix has never been satisfactorily demonstrated. Elongation, if present at all, is almost always at least in the supra-vaginal, not the infra-vaginal portion of the cervix. The utero-vaginal attachment cannot be therefore as indicated at *Z Z*.

The rectum and bladder are subject to infection and chronic catarrh, and the bladder especially to concurrent descent. The uterus may be enlarged from any one or all of a variety of causes: congestion, subinvolution, hypertrophy, and hyperplasia. The cervix is often the seat of extreme erosion or so-called ulceration. The endometrium, in order to relieve the organ of its surplus blood, gives forth an excessive secretion of vitiated mucus. This is termed uterine catarrh. The enlargement of the uterus often pertains more to the cervix than to the body, especially in prolapse of the second and third degrees. An explanation of this may be found in Figure 374.

Apparent elongation and disproportionate circular enlargement of the cervix are conditions which many standard authors wrongly call hypertrophic elongation and circular hypertrophy. The question of

infravaginal elongation is easily settled by placing the patient in the knee-breast position. Then the uterus, by its own weight, falls toward the diaphragm, the reduplicated vagina unfolds, and the apparent utero-vaginal attachment, *X' Z'*, Figures 405 and 406, disappears, disclosing the actual attachment, *X Z*. Further, the point of the sound, passed into the bladder while the cervix is exposed by Sims' speculum, may be placed against the anterior wall of the cervix at *Z*, which would be impossible if the attachment were at *Z'*.

The comparatively small amount of hypertrophy in disproportionate circular enlargement is proved by the operation of trachelorrhaphy or by rolling in the out-rolled tissues with uterine tenacula, as shown in Figure 360. When the out-rolled intracervical mucous tissues are rolled in the proper diameter of the cervix is restored, and a laceration on one or both sides, extending past the vaginal attachment, becomes apparent.

Those cases in which the reduplication of the vaginal walls does not almost entirely explain the great elongation so-called, or in which great disproportionate circular enlargement has not been caused by laceration of the cervix, are the rare exceptions. Formerly these mechanical conditions were attributed to hypertrophic changes, and were regarded as adequate indications for the removal of the cervix. Such elongation as is shown in Figure 407 rarely, if ever, exists. Emmet, with his enormous experience, has never seen such a case, and denies its existence. Any one who will take the trouble to replace the uterus, and then, after a few moments, measure the uterine canal with the probe, will be convinced that the elongation was due to strangulation of the vessels and consequent congestion. The condition simulates that of erect penis, and therefore disappears when the circulation is re-established. The great merit of having secured general assent to the foregoing propositions, and of having given to the subject a new and right direction, must be accorded to Emmet. The cervix now is seldom amputated, except for malignant disease. Hypertrophy and hyperplasia usually cause a nearly symmetrical enlargement of the entire organ.

Congestion of the prolapsed uterus consequent upon obstruction in the stretched and displaced veins is often so extreme as to induce a state analogous to erection. Measurements by the probe just before and a few minutes after replacement generally show a very appreciable decrease in the length of the uterine canal. If the prolapse has been of the third degree, the difference may amount to one or even two inches. It is clearly important not to confound the enlargement of congestion with increase in the solid constituents of the organ. See Laceration of the Cervix.

Symptoms and Course.

The course of descent is ordinarily chronic, but intercurrent attacks of acute vaginitis are not uncommon. Peritonitis sometimes effects a spontaneous cure by peritoneal adhesions that fasten the uterus in an elevated position and hold it permanently. The symptoms of descen-

may be so severe as to necessitate for the patient absolute rest in bed; in other cases they may be attended with very little discomfort; the usual symptoms are these:

1. Abdominal pains.
2. Dragging pains in the pelvis extending to the thighs.
3. Functional disturbances of the bladder and rectum—tenesmus.
4. In cases of complete prolapse; extreme suffering from excoriations of the exposed vagina.
5. Great irritation from vaginitis and pain from possible peritonitis.
6. Uterine hemorrhages—frequent.
7. Leucorrhœa.
8. Sterility.

Diagnosis and Differential Diagnosis.

The diagnosis is by inspection, palpation, and exploration. The prolapsed uterus may be distinguished from cystocele, rectocle, inverted uterus, vaginal cysts, and fibroid tumor by the presence of the os externum. The sound may be passed through the urethra into the cystocele, and the finger through the anus into the rectocele. The length of the uterus may be determined by the sound; the size, shape, position, extent of descent, and difficulty of replacement may be determined by conjoined manipulation.

Diagnosis of Cystocele and Rectocele. Cystocele and rectocele are related to procidentia as follows:

In procidentia cystocele appears first; prolapsed uterus, second; rectocele, third.

Cystocele may be recognized by—

a. A convex protrusion between the labia covered with rugous vaginal mucosa, easily pushed back, and diminishing on lying down.

b. A sound in the bladder may be felt by the finger against the protrusion, thereby demonstrating it to be continuous with the vesico-vaginal wall and formed of it.

c. After urination there will remain residual urine in the protrudings sac. This often causes cystitis and stone in the bladder.

Rectocele may be recognized by—

a. Bulging forward of the posterior vaginal wall, the protruding mass being covered with rugous vaginal mucosa.

b. Mass increasing in size on straining at stool and diminishing on lying down.

c. Finger in the rectum, which enters the protruding mass, and demonstrates it to be continuous with recto-vaginal septum and composed of it.

d. Incomplete evacuation of feces in the pouch and prevention of complete emptying of the bowel; it may be necessary to facilitate defecation by pushing the pouch back with the finger.

Cystocele and rectocele are apt to be associated with intermittent accumulation of urine in the vagina, which may be expelled with a sudden gush, causing incontinence of the vulva.

Diagnosis of Elongation of Cervix. This condition is sometimes found in the second degree of descent, and is caused by the dragging of the anterior wall of the vagina upon the cervix. Elongation caused in this way is always confined to the supra-vaginal portion of the cervix, and may disappear upon replacement of the uterus. Congenital elongation of the cervix has been observed. Apparent infra-vaginal elongation of the cervix has already been discussed in this chapter.

Prophylaxis.

Prophylaxis requires such measures during labor as will prevent long and powerful pressure upon the pelvic floor. After labor any injury to the perineum should be promptly repaired. The vagina should be kept clean by irrigations. The urine, if retained, should be regularly drawn and the bowels moved daily without straining. If conditions be present likely to induce subinvolution, such, for example, as pelvic infection and laceration of the cervix, they should receive treatment at the proper time. Undue relaxation of the pelvic floor necessitates a prolonged rest in bed, the use of astringent douches, and, when the patient resumes the upright position, the application of a pessary. If involution goes on with the uterus congested and irritated by descent, the result is apt to be perpetuation of the displacement and its attendant evils ; it is therefore highly desirable that the uterus be kept in place during the puerperium ; to this end, even while the patient is in bed, a pessary may be indicated. The great prophylactic value of rest in bed, prolonged for seven or eight weeks after labor, is undeniable. The puerperium offers the best conditions for the cure of descent.

Treatment.

Replacement. The first indication is replacement, which, in the first and second degrees of descent, is not difficult unless the uterus is held down by cicatrices or by a tumor. Acute pelvic inflammations may render replacement dangerous or impossible, and may for a time contraindicate all direct treatment. Replacement of the organs from the third degree of prolapse is accomplished in the inverse order of their descent : first, the posterior vaginal wall, then the uterus, and last the anterior vaginal wall. Not infrequently the completely prolapsed uterus and pelvic floor, hernia-like, become strangulated. Then taxis will usually suffice ; but it may have to be supplemented by hot applications, elastic pressure, anodynes, and the knee-breast position, and, should these fail, anæsthesia.

In exceptional cases of sudden descent, even to the third degree, replacement alone is sometimes followed by permanent relief ; but if the descent has been gradual, it always occurs immediately after replacement. Measures are therefore required for the maintenance of the uterus in the normal location and position. This indication is fulfilled by :

1. Hygiene.
2. General and local measures.
3. Pessaries.
4. Surgical operations.

The Hygiene principally relates to dress, food, and regular habit of the bowels. Undue pressure from above should, if possible, be removed. The clothing should be loose, and the weight of the skirts supported from the shoulders either by straps or, preferably, by buttoning them upon a waist made for the purpose. This waist is a good substitute for the corset, which, under all circumstances and in all forms, is injurious. See Chapter IX. Constipation and the accumulation of feces in the lower bowel mechanically irritate and may displace the pelvic organs; straining at stool exerts a strong downward pressure on the uterus and its appendages. Careful regulation of the bowels is therefore imperative; to this purpose food and exercise are the most essential agents.

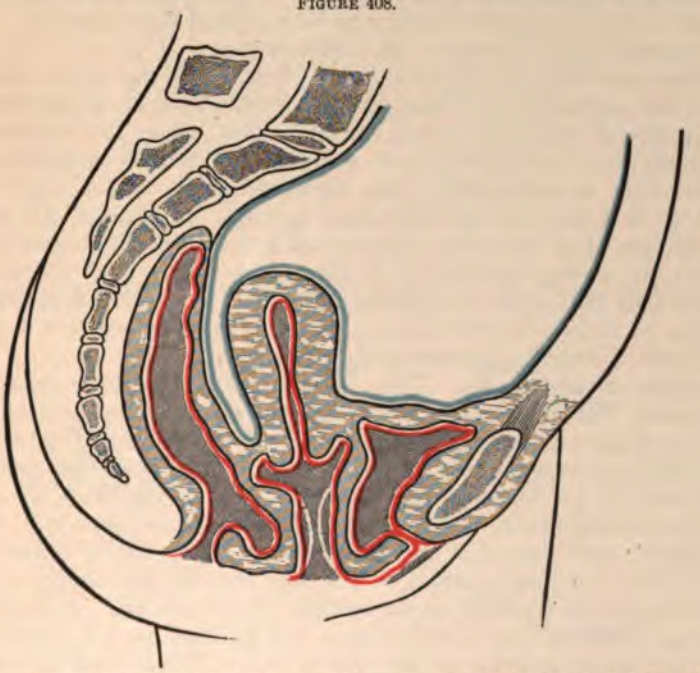
General and Local Measures. The value of general massage for women unable to take active exercise is very great. As a supplement to massage, or as an independent measure, one may strongly urge the knee-breast position. This position assumed several times a day causes the uterus to gravitate toward the diaphragm, and thereby gives temporary rest to the overburdened supports. While in this position the patient should separate the labia, so that the air may rush in and the vagina become expanded. Mineral waters and general tonics are useful. The measures enumerated above, together with such topical treatment as local conditions may demand, are essential as adjuvants to the mechanical or surgical treatment which almost every case requires.

Pessaries. The first change in the genesis of retroversion and retroflexion is descent; hence, the principles of mechanical treatment must be substantially the same for each. The reader is therefore referred to the indications, the contraindications, modes of adjustment, and uses of pessaries in the treatment of retroversion and retroflexion.

In complete prolapse dependent upon extensive injuries to the perineum and other parts of the pelvic floor, and associated with extreme subinvolution and relaxation of all the pelvic organs, the axis of the vagina is changed from its forward oblique to the vertical direction. See Figure 376. The downward traction of the prolapsing cystocele and rectocele upon the fornix of the vagina may then be so great that the pessary is inadequate to maintain in place the upper extremity of the vagina. The cervix then moves forward, the corpus turns back, and the whole uterus easily descends in a vertical direction along the prolapsing walls of the vagina to the second or third degree of prolapse. In this condition pessaries that disappear within the vagina are liable to be forced out with the prolapsing pelvic floor, or, if retained, seldom maintain the uterus in position. In such cases the various cup pessaries, that are supplied with external attachments and abdominal belts, are often used; but they either so fix the uterus as to prevent its normal movements, or hold it in such unstable equilibrium that it may assume any one of the various malpositions—anterior, posterior, or lateral; they are open to the further serious objection of constantly reminding the patient of their presence, and for these reasons are not generally approved; they are, however,

permissible in cases of complete prolapse, when the patient refuses surgical relief. As an expedient, the uterus may sometimes be held within the pelvis by means of a large Albert Smith pessary, with extreme uterine and pubic curves; see Application of Pessaries in the Treatment of Retroversion. The rational treatment, however, requires: first, an operation on an anterior vaginal wall to restore the fornix of the vagina to its normal place in the hollow of the sacrum, and with it the attached cervix; second, an operation at the vaginal outlet to bring the posterior vaginal wall well in contact with the anterior and thereby to restore the lower extremity of the vagina, together with the perineum, to its normal place under the pubis.

FIGURE 408.



Uterus in line with the vagina; first degree of descent. The white lines in the vagina show where it would be narrowed by the first class of operations.

Plastic Operations. The numerous plastic operations for the relief of complete descent of the uterus are divisible into two classes:

1. Operations designed to hold the uterus up by narrowing the vagina so much that the uterus cannot pass through it, and, consequently, must be maintained somewhere in the pelvis above the vaginal constriction. These operations usually consist in the removal of an elliptical piece from the anterior or posterior wall of the vagina, or from both; or of making longitudinal denudations and bringing the edges of the exposed surfaces together from side to side. In this class of operations no effort is made to restore the normal axes of the uterus or the vagina. The whole purpose is to make the vagina so narrow that the uterus cannot pass through it.

Operations of this class generally fail, because they do not restore the normal angle between the uterus and the vagina. The constricted vagina, indicated by the white lines in Figure 408, cannot resist the downward force of the uterus, which almost invariably dilates the vagina a second time, forces itself through, and reproduces the hernia. Moreover, the operation does permanent harm, because it shortens the vagina, thereby making it draw the cervix away from the sacrum toward the pubes. This forward movement of the cervix, as already stated, is an essential element in the genesis of descent.

2. Operations designed to hold the uterus in position by restoring the normal angle between the long axis of the uterus and the long axis of the vagina, may somewhat narrow the vagina, but such narrowing is only an incident rather to be regretted than desired. It is not essential to the success of the operation.

There are two rational indications: first, to fix the upper extremity of the vagina in its normal location within an inch of the junction of the second and third sacral vertebræ, just where the utero-sacral ligaments would hold it if their normal tonicity and integrity could be restored; second, to bring the lower extremity of the vagina forward, so that its posterior wall shall be close up against the pubes. The fulfilment of these two indications will restore the normal obliquity to the vagina, and will hold the cervix so far back toward the sacrum that the corpus uteri must be forward in its normal anteverted position of mobile equilibrium. These indications are best fulfilled by lateral elytrorrhaphy and perineorrhaphy.

Lateral Elytrorrhaphy.[1] The operation of lateral elytrorrhaphy is performed with the patient under anæsthesia, in Sims' position and with the vagina exposed by means of Sims' speculum. The blade of this speculum is perforated at its extreme end. Before the speculum is introduced the cervix is attached to the end of the blade by means of a temporary suture which is passed through the posterior lip of the cervix and then through the perforation in the speculum, and tied. This temporary stitch, while the sutures are being applied, holds the cervix far back in the hollow of the sacrum; it should be removed at the end of the operation. When the cervix is thus held back, the space anterior to the uterus is so increased that the uterus readily falls forward into a position of decided anteversion. It is essential that the operation be done with the organ in normal position. The first step in the operation proper is to denude two semicircular strips, *x y* and *x′ y′*, Figure 409, in the vaginal wall close to the uterus, about one-third of an inch wide, on either side of the cervix, their concavity being toward the cervix, as shown in Figures 409 and 410. Figure 410 is a section, and shows the denudation only on one side of the cervix.

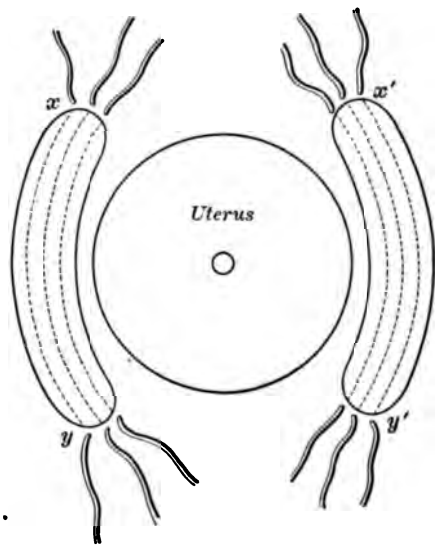
Each denuded surface is then closed upon itself by means of silkworm-gut sutures. Figures 409 and 410 show the sutures as introduced before tying. Figure 411 (*a b* and *c d*) and Figure 412 (*a b*) show the lines of union after the sutures have been tied.

In the folding of each of these denuded surfaces upon itself their

[1] E. C. Dudley. New York Journal of Gynecology and Obstetrics, July, 1894.

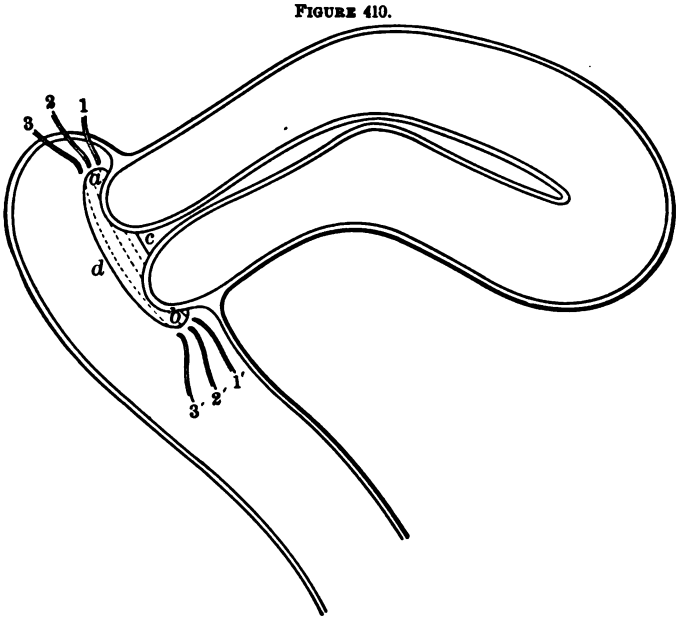
lower extremities, y and y', are brought in contact with their upper

FIGURE 409.



Lateral denudations as seen looking through the speculum. Sutures in place, but not tied. Diagrammatic.

FIGURE 410.



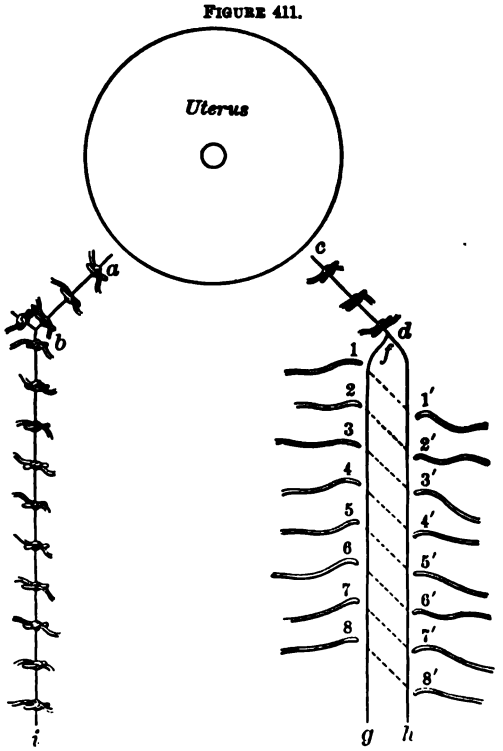
Lateral denudations on one side in sagittal section. Diagrammatic.

extremities, x and x', Figure 409. By this means the cervix is lifted bodily upward and backward.

The next step in the operation is to denude two strips about a

quarter of an inch wide, extending from points *b* and *d* to points *i* and *g h*, Figure 411, or from point *b* to point *c*, Figure 412, along the lateral sulci of the vagina to the vaginal outlet, terminating in the lateral sulcus of the vagina on either side of the urethra. The lateral edges of each of these two denuded surfaces are now brought together by means of sutures passed, not transversely across the denuded strip, but obliquely (see sutures 1—1′, 2—2′, 3—3′, etc., Figures 411 and 412). One side of each of these denuded strips is adjacent to the anterior vaginal wall, and the other is adjacent to the posterior vaginal wall. Upon tying these obliquely placed sutures, Figures 411 and 412, it will be seen that point 1 is brought into coinci-

FIGURE 411.

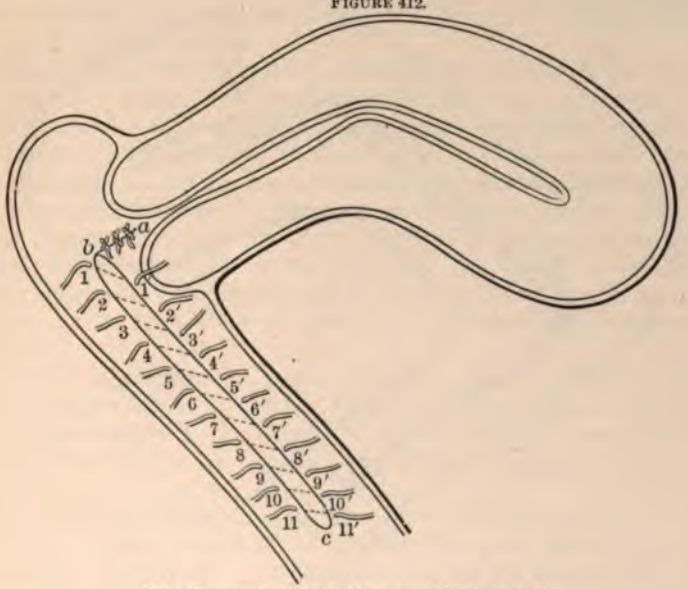


Showing the sutures in place before tying on the right side and after tying on the left.

dence with point 1′, point 2 with point 2′, and so on. The effect of this method of suturing when applied to both sides of the vagina is to slide the anterior vaginal wall upward and backward on the posterior vaginal wall and to fix it there. The line of union made by suture *d*, Figure 413, closes and disposes of the redundant margin of the wound produced by sliding the anterior wall up on the posterior. The cervix uteri, being so to speak in the anterior vaginal wall, must participate in this upward and backward movement. The fascia and other structures which compose the lateral walls of the

vagina are much more fixed than the corresponding structures in the anterior or posterior wall; consequently the sustaining power of sutures in this location is greater than in any operation on the anterior or posterior wall. My own experience of many years in this lateral operation has shown permanently good results so far as I have been able to follow the cases. The object accomplished by the operation is the restoration of the upper extremity of the vagina and of the anterior vaginal wall to its normal location and direction. By this means the cervix uteri is forced back to its normal location near the hollow of the sacrum, and thereby the body of the uterus is made

FIGURE 412.



Lateral sutures on one side, passed but not tied.

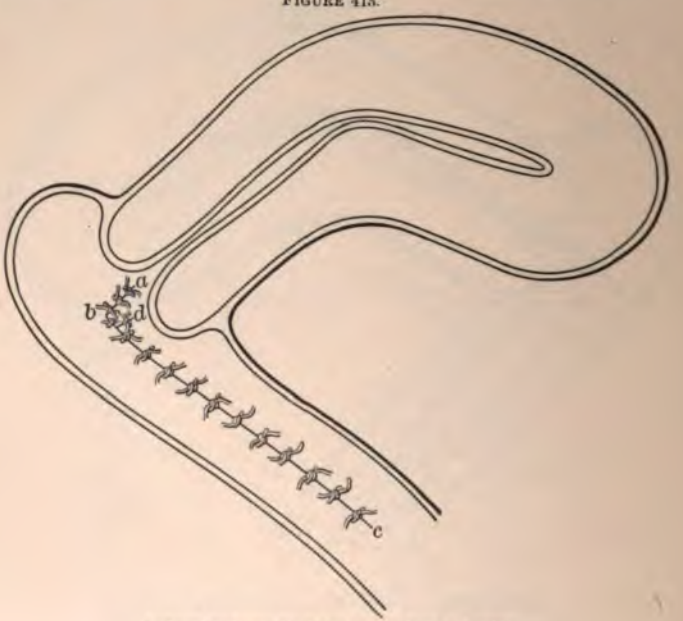
to follow the direction of least resistance into its normal anterior position.

Perineorrhaphy. It is most important to appreciate the fact that in nearly every case of procidentia the lower extremity of the vagina is displaced backward. This is consequent upon subinvolution of the vaginal walls, and especially upon subinvolution or rupture of the perineum or of some other portion of the vaginal outlet. Unless, therefore, the posterior wall of the vagina and the perineum can be brought forward to their normal location under the pubes, so as to give support to the anterior vaginal wall, the latter will again fall, will drag the uterus after it, and the hernial protrusion will be reproduced. The treatment, therefore, of complete procidentia must always include an adequate operation upon the perineum, or, more comprehensively speaking, upon the vaginal outlet. The operation must be so performed that it will carry the lower extremity of the vagina forward to the normal location close up under the pubes; then, if the lateral ely-

trorrhapy is adequate, the whole vagina will have its normal oblique direction, and its long axis will make an acute angle to the long axis of the uterus. When this angle is maintained, the uterus cannot easily turn the sharp corner which will bring its long axis into coincidence with that of the vagina, and cannot, therefore, readily prolapse. The writer, in a large experience, has observed recurrence of the prolapse in only one case.

Contraindication to Elytrorrhaphy. Elytrorrhaphy is usually unnecessary and therefore contraindicated in descent of the first degree. The special province of the operation is in complete prolapse or pro-

FIGURE 413.



Lateral sutures tied and operation complete.

cidentia. The operation is further contraindicated by tumors and adhesions which render replacement and retention impossible, and in diseases of the uterus or its appendages which demand their removal. When such contraindications do not exist elytrorrhaphy and perineorrhaphy are, usually at least, quite as effective, and are therefore to be preferred to the more dangerous and mutilating operation of hysterectomy.

Hysterectomy, if indicated, should be performed by the vaginal route in the same manner as described for cancer on page 409. As an operation for procidentia hysterectomy is open to the following comments: Procidentia, as already shown, is descent not merely of the uterus, but also of the vagina, bladder, and rectum. Complete prolapse often occurs after the menopause, when the uterus has become an insignificant rudimentary organ. Its removal, therefore, without

further operation on the vaginal walls, is inadequate. Cases are numerous in which, after vaginal hysterectomy, the pelvic floor, and with it the vaginal walls, have again protruded through the vulva. For this reason the operation should always include anchorage of the upper end of the vagina to its normal location by stitching the severed ends of the broad ligaments into the wound made by the removal of the uterus. The indication for perineorrhaphy is the same as after elytrorrhaphy. Elytrorrhaphy is, for various reasons, less strongly preferred for procidentia after the menopause than before. The writer's only failure to secure a permanent result was in a case of descent of a senile uterus. It is probable that hysterectomy is the better operation for many of the senile cases. See plates on hysterectomy for carcinoma uteri.

Other Operations designed to decrease the weight of the uterus by the removal of a part of it are of questionable value; increased weight may arise from subinvolution, hypertrophy, congestion, hyperplasia, and tumors. The treatment of these conditions is described elsewhere.

Amputation of the cervix to lighten the weight of the uterus has been much practised in the spurious circular hypertrophy and hypertrophic elongation, shown in Figure 407. Since these two conditions are rare, if not indeed unknown, it follows that they could seldom furnish an indication for amputation of the cervix uteri. It is, in fact, difficult to imagine a class of cases in which this operation would be indicated.

Emmet's exposure of the true pathology in this class of cases has led to the substitution of trachelorrhaphy or of Schröder's operation.

Tumors increasing the weight of the uterus and tumors exerting pressure from above or traction from below should, if possible, be removed.

Alexander's operation and abdominal hysterorrhaphy are described under the surgical treatment of retroversion and retroflexion. The object of these operations is to suspend the uterus from above. Hysterorrhaphy, which fulfils this indication better than shortening the round ligaments, may be indicated in cases of extreme relaxation of the uterine supports and greatly increased weight of the uterus. Its results in procidentia, however, will usually not be permanent unless it is supplemented by elytrorrhaphy and perineorrhaphy.

Enteroptosis as a Complication of Descent of the Uterus.

In many cases of descent of the uterus the displacement is aggravated by alterations in abdominal pressure associated with descent of the abdominal viscera, especially the stomach and intestines. This is called enteroptosis. Webster has laid stress upon the fact that general weakness and laxity of the abdominal wall are not, as usually supposed, the cause of the enteroptosis, but that the descent of the viscera is due to excessive separation of the recti muscle, due to stretching of the linea alba. All conditions that increase abdominal pressure, especially during pregnancy, such as the wearing of corsets and overwork, predispose to enteroptosis.

Success in the treatment of uterine displacement will frequently depend upon associating with it some effective measure for the correction of the pendulous abdomen—that is, of the enteroptosis. Temporary correction may be secured by a properly fitting abdominal bandage of the Empire type. Permanent correction in most cases will require an abdominal section and such closure of the wound as will correct the diastasis of the rectus muscles. The operation is the same in principle as that described by Edebohls for closure of the abdominal wound, an operation set forth in Chapter VI. In this operation it was not proposed to open the abdomen for the purpose of treating enteroptosis, but, the abdomen having been opened for other purposes, to close it in such a manner as to overcome any pendulous condition that might exist. The operation proposed by Webster is the deliberate opening of the abdomen for the cure of enteroptosis. It is much the same as that which for a long time has been performed for the relief of ventral hernia, and is substantially as follows:

An incision is made in the median line dividing the skin and subcutaneous fat until the linea alba is exposed. The length of the incision should vary with the extent of the separation of the recti muscles. In aggravated cases it should extend from the symphysis pubis nearly to the ensiform cartilage. The umbilicus, if deep and difficult to clean thoroughly, should be removed; otherwise the mesial incision may be carried around to the left of it. The skin and fat should be dissected from the fascia on both sides, so as to expose the edge of each rectus muscle. The sheath of each muscle is then split longitudinally along the inner border and the incision continued to the extent of the diastasis. The inner borders of the muscles are then loosened from the sheaths and united by a series of sutures passed from side to side through each muscle and the corresponding anterior fascia or sheath layer. These sutures when tied will obliterate the stretched-out linea alba, approximate the muscles and cover them with fascia. Webster recommends strong linen sutures, which are left permanently buried. The author uses chromic catgut as a continuous suture throughout. See Chapter VI. Some bulging of the skin may follow the reduction in the size of the inner abdominal wall, but after a little time this usually disappears. In cases of excessive relaxation a strip of fat and skin may be removed before passing the superficial sutures. The use of a broad silk elastic binder, daily massage of the abdominal parietes, followed later by light gymnastic exercise and abstinence from severe exertion during a period of six months, are recommended as part of the after-treatment.

On the suggestion of Edebohls, the author has for several years, when closing the abdominal incision, felt himself justified in splitting the sheaths of the recti muscles and bringing the fascia together with continuous chromic catgut sutures as a means of protection against possible diastasis of those muscles and consequent enteroptosis.

CHAPTER XLVI.

RETROVERSION AND RETROFLEXION.

Etiology. Pathology. Symptoms. Cures. Diagnosis. Prognosis.

RETROVERSION.

RETROVERSION is that abnormal position of the uterus in which the fundus is posterior to the axis of the pelvic inlet. If the cervix be in its normal place, near the sacrum, retroversion is scarcely possible, because it is prevented by the proximity of the over-arching sacrum. See Figure 397. The first degree of prolapse must, usually, precede any considerable backward turning of the uterus. When the cervix has been displaced downward and forward so far that its distance from the sacrum is equal to or greater than the length of the uterus, retroversion to any extent becomes possible. See Figures 414 and 415.

Etiology and Description.

From the above it follows that the causes of beginning retroversion must be identical with the causes of the first degree of prolapse. After the puerperium the relaxation of the supports and the weight of the displaced organ may persist, and this, together with the pressure and weight of the intestines upon the anterior surfaces of the uterus, may prevent spontaneous replacement. Every act of defecation forces the cervix forward and downward, and the uterus, being in the axis of the vagina, and having, therefore, little support below, must depend for support upon the now inadequate subinvoluted peritoneal suspensory ligaments and pelvic fascia. Abortion, with resulting increased weight and relaxation of the vaginal walls, is a common cause. Metritis, parametritis, perimetritis, peritonitis, salpingitis, and ovaritis are frequent complications, and may stand in the relation of cause or effect.

Congenital retroversion is rare. Retroposition of the small senile uterus after the menopause is not abnormal. Peritoneal adhesions and cicatricial bands may permanently fix the corpus in a retroverted position. In extreme retroversion the corpus is often incarcerated between the utero-sacral ligaments. Chronic cystitis and consequent contraction of the bladder shortens the vesico-vaginal wall, and thereby draws the cervix forward. This makes a permanent incurable displacement.

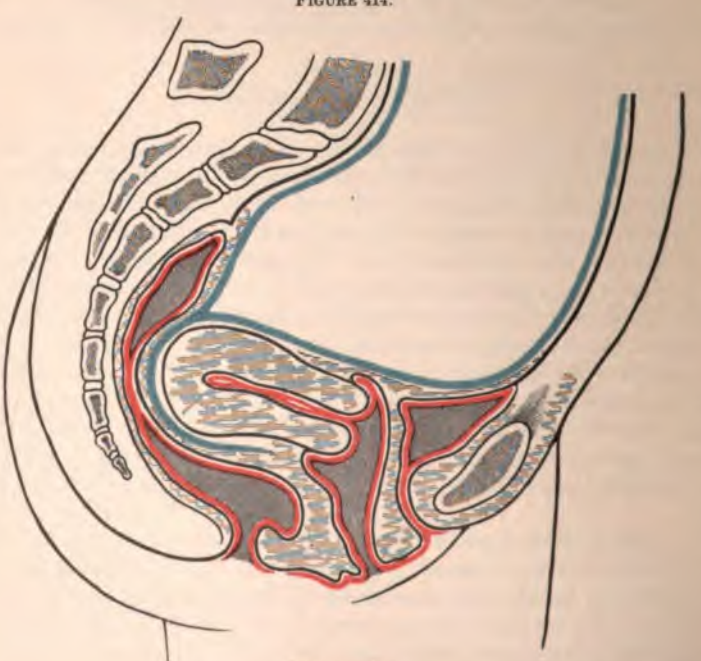
The causes of retroversion may be summarized as follows:

1. Distention of the bladder.
2. Increased weight of the uterus and relaxation of the supports—common cause in early puerperium.
3. Retro-uterine peritonitis—contracting adhesions.
4. Sudden straining, violent fall, or blow.
5. Chronic cystitis, which shortens the vesico-vaginal septum by contraction—an intractable cause.
6. Small myoma in posterior wall of the corpus uteri.
7. The dorsal position and tight bandaging in the puerperium.
8. Congenital—rare.

Symptoms and Course.

The displacement of retroversion and its numerous complications usually cause bearing-down sensations, a feeling of heaviness in the pelvis, exhaustion upon walking and standing, especially the latter. Constipation may be a cause or an effect. After the puerperium the extreme engorgement of the pelvic organs often contributes to hemorrhagic endometritis. The hemorrhage then should not be confounded

FIGURE 414.



Retroversion.

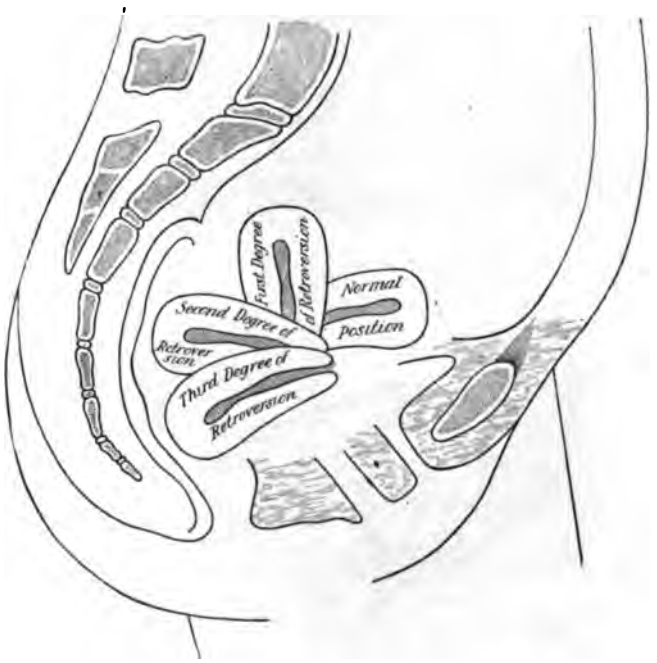
with returning menstruation. The bleeding, especially after abortion, unless cured by treatment, often persists for a long time. Grad-

ual or sudden replacement may occur spontaneously; or, the causes continuing active, the displacement may persist and even be reinforced by cystocele and rectocele. There is usually concurrent displacement of the ovaries and Fallopian tubes. Nutritive changes in the uterine walls may induce a superadded retroflexion. The heavy organ may descend along the relaxed, subinvoluted vaginal walls even to complete procidentia.

Diagnosis and Prognosis.

The symptoms indicate the probability of displacement, but definite diagnosis depends upon direct examination. Conjoined manipulation will usually show the retroverted organ, with the cervix displaced toward the pubes and with the corpus in the hollow of the sacrum. In certain cases of anteflexion, as represented in Chapter XLVIII., the cervix is bent forward in the vaginal axis as in retroversion. The condition is in reality one of retroversion of the cervix, with high anteflexion of the corpus. Careful conjoined examination will usually

FIGURE 415.



Degrees of retroversion.[1]

clear the diagnosis. Under treatment, the prognosis both for speedy relief and ultimate recovery, is generally favorable.

[1] Suggested by Penrose. Diseases of Women.

Degrees of Retroversion.

Retroversion will be slight or extreme, according to the extent to which the axis of the uterus is turned back. Three degrees of displacement are usually recognized; but the division is arbitrary, and, except for purposes of description, has no practical significance. See Figure 383.

Treatment.

The treatment, as in descent, consists of the removal of the inflammatory and other complications, in the use of pessaries, and in surgical operations. Inasmuch as the treatment is similar to that of retroflexion, the treatment of retroversion and retroflexion will be presented together. See Chapter XLVII.

RETROFLEXION.

Retroflexion is that displacement in which the organ is bent back upon itself. It usually, though not always, results from, and is associated with, retroversion; but, for convenience, the double displacement will be termed retroflexion.

FIGURE 416.

Extreme retroflexion with hypertrophy of the corpus uteri. The uterus impinges on and compresses the rectum.

Etiology and Pathology.

The causes of retroflexion may be summarized as follows:

1. All causes of retroversion, see above.
2. The dorsal position and tight bandaging in the puerperium.
3. An infectious puerperium impairing the nutrition of the uterine walls and supports.
4. Pressure by tumors—also a cause of retroversion.
5. Congenital—rare.

Among the causes of retroflexion are great weight of the corpus uteri, the soft mobile state of the uterine walls so common during the puerperium, intra-abdominal forces, downward pressure during defecation, tight clothing, and the obstetric bandage. Metritis, perimetritis, either as cause or effect, are almost invariably associated with retroflexion. The displacement is not uncommonly due to the presence of a myoma in the posterior wall of the uterus. In rare cases the displacement is congenital, and the reproductive organs are then all under-developed.

The ovaries and Fallopian tubes, unless fixed elsewhere by adhesions, are usually held down on either side of the corpus uteri. They are sometimes much enlarged by inflammation, often adherent, and always extremely sensitive. Infection of the uterus and its appendages from bacterial invasion is almost invariably the essential cause. The displacement often follows parturition, abortion, and injudicious treatment. Gonorrhœa and the puerperal infections are frequent causes. Peritoneal adhesions between the corpus uteri and the pouch of Douglas may render replacement impossible, except by abdominal or vaginal section.

Symptoms and Course.

In many cases there are no symptoms. The conditions frequently associated with retroflexion are these:

1. Sterility.
2. Abortion.
3. Leucorrhœa.
4. Dysmenorrhœa.
5. Uterine hemorrhage.
6. Constipation and painful defecation.
7. Weakness in the back and dragging sensations in the pelvis.
8. Reflex pains in distant organs.

The symptoms of pelvic inflammation predominate. Uterine discharges, menstrual disorders, sterility, abortion, weakness, pain in the back, painful defecation, rectal tenesmus, menorrhagia, and dysmenorrhœa are among the usual manifestations.

Uterine discharges, menorrhagia, and abortion are the result of endometritis, and are due to the effort of an engorged uterus to relieve itself of congestion by increased secretions or increased menstruation.

Abortion, dysmenorrhœa, and sterility may result from a wide range of associated conditions, chief among them faulty nutrition, inflam-

matory complications, and mechanical obstruction in the uterine canal at the angle of flexure. The rectal symptoms are caused by the proximity of the inflamed uterus and its appendages to the bowel. This gives to the patient the sensation of a full bowel, and is therefore a cause of tenesmus. Passage of the bowel-contents through this sensitive zone is necessarily painful. Abdominal pains, nervous dyspepsia, neuralgia in distant parts of the body, and neurasthenia are often present; indeed, the nervous symptoms may be of the most exaggerated character, and may comprise all that is implied by the word hysteria in its most comprehensive signification.

Should pregnancy occur the rapid growth of the uterus may induce spontaneous reposition; this is likely to take place when the fundus rises out of the pelvis at about the fourth month; but if the corpus be incarcerated under the sacral promontory from adhesions or from any other cause, the uterus, unless manually replaced, will relieve itself by a dangerous abortion.

Diagnosis.

The diagnosis should include an inquiry into:

1. The location and position of the uterus relative to neighboring organs.
2. The mobility of the uterus.
3. The complications.

Digital touch discloses the cervix uteri low in the pelvis. The fundus uteri is felt through the posterior vaginal wall in the cul-de-sac of Douglas. Conjoined manipulation with the index-finger of the left hand, first in the vagina, then in the rectum, and the right hand over the hypogastric region, will show the size, form, consistency, and location of the uterus, the degree of flexion, and the difficulty of replacement. An inflammatory deposit or abscess posterior to the uterus, or a fibroid in the posterior uterine wall, may be mistaken for the retroflexed corpus. The probe is seldom necessary to verify the diagnosis. Its use is subject to strict antiseptic conditions, for otherwise additional infection may be introduced. In some cases of difficult diagnosis it is better at first to direct the treatment to the inflammation and defer the precise diagnosis of the displacement to a later date. Great and lasting injury is often wrought in the attempt to complete the diagnosis at the first examination. The presence of a myoma in the posterior uterine wall, with post-uterine inflammation, is a serious complication both in diagnosis and treatment. If the rectum be overloaded with fecal matter, a cathartic should be given and the complete digital examination deferred. The displacement is distinguished from the presence of an ovary or small ovarian tumor in the pouch of Douglas, by careful bimanual examination and by the probe.

Diagnosis in the Puerperium. Flooding, which begins two or three weeks after labor, and with small daily losses of blood during the puerperium, are evidences of retro-displacement.

Diagnosis of Complications. The following complications may have the relation either of cause or effect to the displacement:

1. *Perimetritic fixation*—result of perimetritis—is recognized by bands of adhesions palpated behind and to the sides of the uterus and felt about the corpus above the plane of the internal os, near the fundus. Perimetritic adhesions commonly fix the uterus to the tubes, ovaries, or broad ligaments, and such adhesions form a mass recognized by conjoined palpation.

2. *Parametritic fixation*—result of parametritis cellulitis—is felt more usually below the plane of the os internum ; it draws the cervix laterally, anteriorly, or posteriorly toward the pelvic wall by contraction of inflamed cellular tissue, is thicker and more dense than perimetritic adhesions, and lower in the pelvis.

Differential Diagnosis.

The differential diagnosis should include a consideration of inflammatory retro-uterine masses, retro-uterine myomata, and fecal accumulations.

Retro-uterine inflammatory products and myomata in the posterior wall of the uterus may be recognized by the location of the fundus uteri lying in front of the mass. The examination should be made by :

a. Conjoined palpation with or without narcosis.

b. The uterine sound—used with caution.

c. Rectal touch—most important.

The tumor, whether inflammatory or myomatous, is usually wider than the uterus, often not directly behind the cervix, but to one side, and may be irregular in outline. The contrary is true of the retroflexed corpus uteri.

Fecal accumulations may be excluded by cathartics.

CHAPTER XLVII.

TREATMENT OF RETROVERSION AND RETROFLEXION.

THE objects of treatment are replacement and retention of the uterus.

Obstacles to Replacement.

The obstacles to replacement are tumors, inflammation, and fixation of the uterus. The inflammatory complications often require weeks, and in severe cases months, of treatment preparatory to replacement; not uncommonly a tumor must be removed by a surgical operation. Some of the general therapeutic suggestions under the subject of descent are also applicable to retropositions. Thus rest, massage, careful regulation of the bowels, forced feeding, and general tonics may be useful.

For pelvic inflammation, small blisters over the inguinal regions, frequently repeated, and the daily application of a cotton and glycerin plug to the cervix, are common routine measures of value. The most useful and essential topical application is the hot-water vaginal douche. The proper manner of giving the douche is described in Chapter IV. See also Chapter XXII.

As the tenderness disappears the cotton plugs may be increased in quantity, and thereby made to serve as temporary support for the uterus until the more permanent pessary can possibly be substituted. The sluggish circulation in the pelvis and torpid condition of the bowels may be much relieved by the daily application of the hot hip-pack; it is applied as follows:

A small flannel sheet, folded lengthwise to the width of two feet, dipped in very hot water and dried by passing it through a wringer, is wound about the hips and covered by another dry one. At the end of half an hour, during which time the patient maintains the recumbent position, the sheets are removed. A hot-water bag between the wet and the dry sheet will serve to prolong the heat.

When the tenderness has been sufficiently reduced, gentle attempts at replacement may be made every day or two by conjoined manipulation. The patient's tolerance of manipulation may thus be observed and the way prepared for complete replacement and permanent retention after subsidence of the inflammation.

Fixation and tenderness, until overcome by appropriate treatment, are contraindications to replacement.

Methods of Replacement.

Manipulation. The safest and most effective method of replacement is by conjoined manipulation, as shown in the following illus-

trations. Efficient reposition of the uterus is very often impossible without anæsthesia. This is especially true when the corpus is wedged in and incarcerated between the utero-sacral ligaments under the sacral promontory, a condition often mistaken for displacement with adhesions.

The replacement is not usually accomplished by drawing the fundus directly forward and pushing the cervix back directly in the median line, but in most cases by sweeping the fundus around the arc of a circle on the left side of the pelvis and the cervix on the right. This is owing to the greater frequency of infection on the left side, and consequent shortening of the left broad ligament. After replacement the organ is to be held in position by appropriate means.

Bimanual replacement has three great advantages over the more familiar methods of the sound or repositor: first, it is more effective and more permanent; second, the lever action of the sound or repositor, by which the operator may unwittingly use an undue and dangerous amount of force, is avoided in the use of the hand; third, the operation is not only constantly under the operator's control, but also within his appreciation.

Experience has abundantly shown that instrumental uterine reposition by means of the sound or other instruments which enter the endometrium, and act by leverage, is unnecessary, dangerous, and therefore usually disapproved.

Manipulation in the treatment of displacements, especially in overcoming the obstacles to replacement, has a definite and well-defined value. For general indications, *and especially the contraindications* of manipulations, see paragraph on Massage in Chapter XXII.

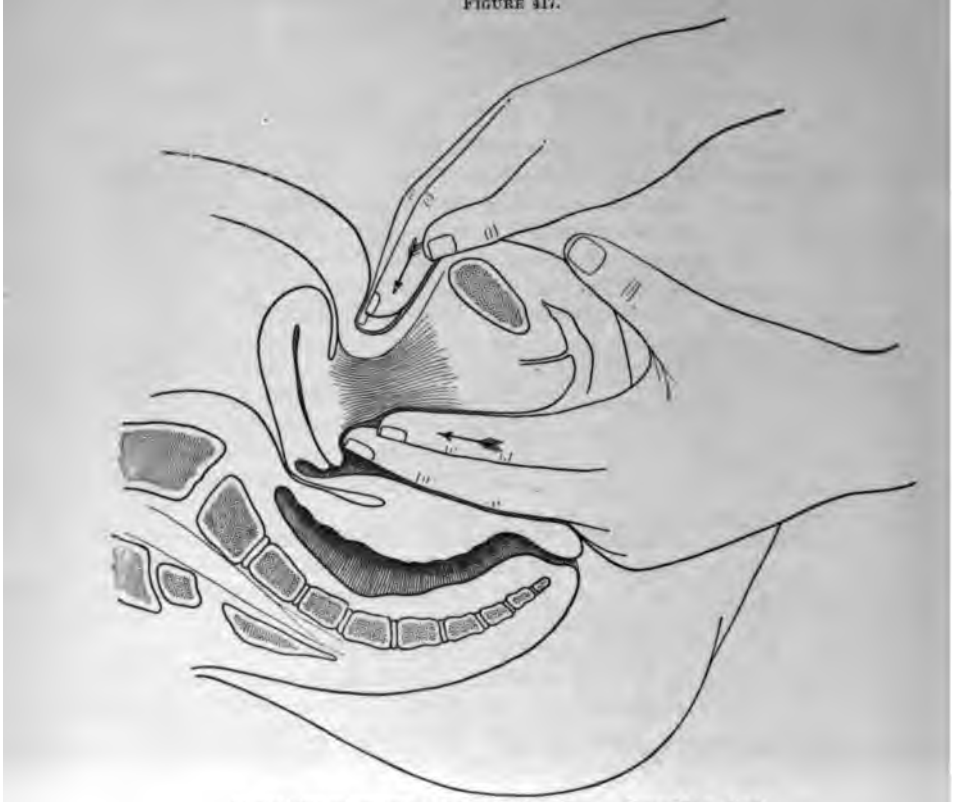
Manipulation in the Treatment of Retro-position complicated by Anterior Adhesions and Contractions.

A serious obstacle to replacement and retention of a retroposed uterus is the presence of contracted tissue between the cervix uteri and pubes, which antelocates the cervix to such an extent that the corpus has space to fall back under the sacral promontory. Under such conditions the corpus cannot be brought forward and retained in normal anteversion until the contracted tissue or bands which hold the cervix forward can be so stretched or broken as to permit the cervix to return to its normal location near the hollow of the sacrum; this may sometimes be accomplished by manipulation, and several weeks of treatment may be required to obtain the desired result. The manipulations are shown in Figures 417 and 418.

The first one or two treatments are tentative. When the sensitiveness decreases and the diagnosis is perfected, an attempt should be made gradually to stretch or break the adhesions and to stretch the contracted ligaments.

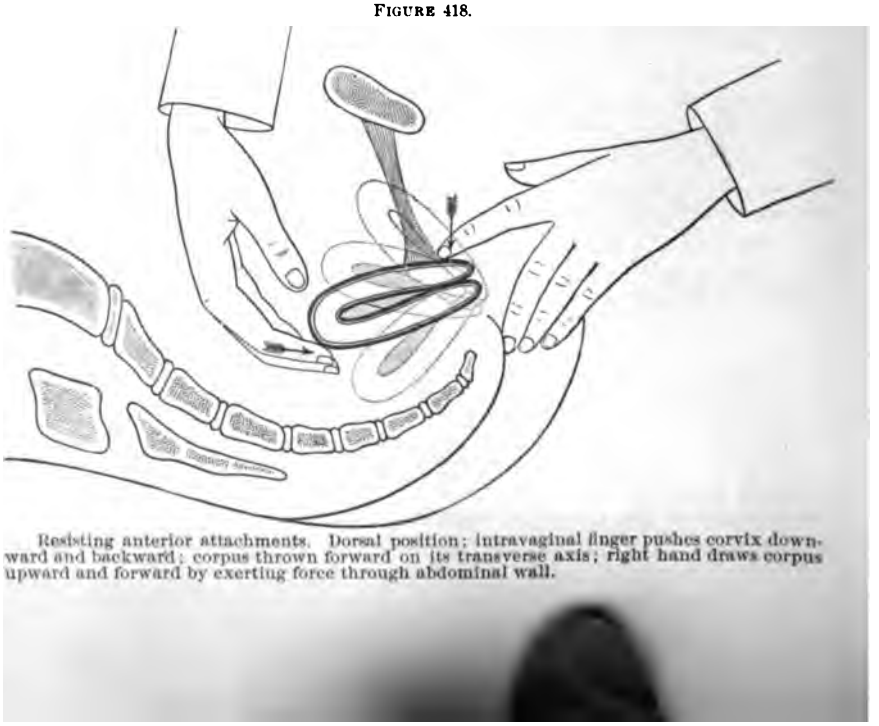
When, after two or more treatments, the parts have become sufficiently mobile, the patient is placed in the recumbent position and the treatment continued bimanually. With the left index-finger in the posterior cul-de-sac, the body of the uterus is raised as far as

FIGURE 417.



Stretching adhesions anterior to the uterus. Brandt's method.

FIGURE 418.



Resisting anterior attachments. Dorsal position; intravaginal finger pushes cervix downward and backward; corpus thrown forward on its transverse axis; right hand draws corpus upward and forward by exerting force through abdominal wall.

practicable in the median line. The intravaginal finger is now transferred to the front of the cervix, while the external hand readily pushes the uterus backward, so as to move it away from the symphysis and still further stretch the adhesion bands. See Figure 417.

By pressing the fingers of the external hand down behind the symphysis, they are made to meet the intravaginal fingers in front of the uterus. The two hands thus brought together now push the uterus in the following directions: the internal fingers, backward and upward; the external hand, backward and downward.

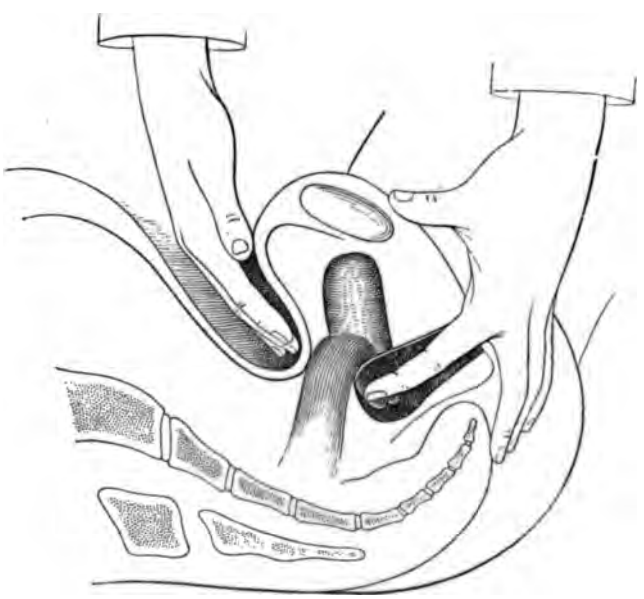
As soon as there appears a limit to the ready extension of the tissues the pressure is stopped. These movements are repeated several times in front and on the sides of the cervix uteri until the adhesions have attained a certain degree of elasticity.

Figures 417 and 418, with the accompanying explanations, will serve to guide the operator in the manipulation of anterior adhesions. All these manipulations are supplemented by stroking, vibratory, or circular frictionary movements with the external hand.

Manipulation in the Treatment of Retroposition Complicated by Posterior Adhesions and Contractions.

Posterior adhesions and contractions may be stretched and broken on the same principles and by the same manipulations as those already set forth for anterior adhesions and contractions. Figure 419. Just

FIGURE 419.



Stretching or breaking posterior adhesions.

before the close of the treatment pelvic massage is applied to the broad ligaments and folds of Douglas. See Chapter XXII.

Replacement and Retention of the Retroposed Uterus.

When sufficient mobility of the uterus has been secured, replacement and retention to the normal position are the next indication. Brandt's method includes numerous manipulations which, from experience, he has found suited to replace the uterus and to give it stable equilibrium. The leading features of his methods are given in the following paragraphs and illustrations, taken mainly from Jentzer.

FIGURE 420.

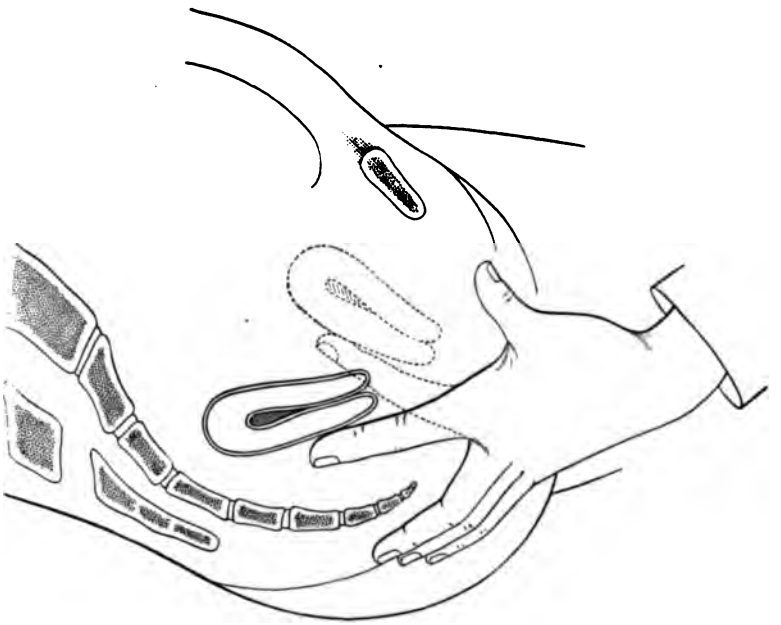
Ventro-vaginal reposition; beginning of first step.

When sufficient mobility of the corpus has been secured, careful attempts at replacement should be made.

Manual Ventro-vaginal Reposition of the Retroposed Uterus.

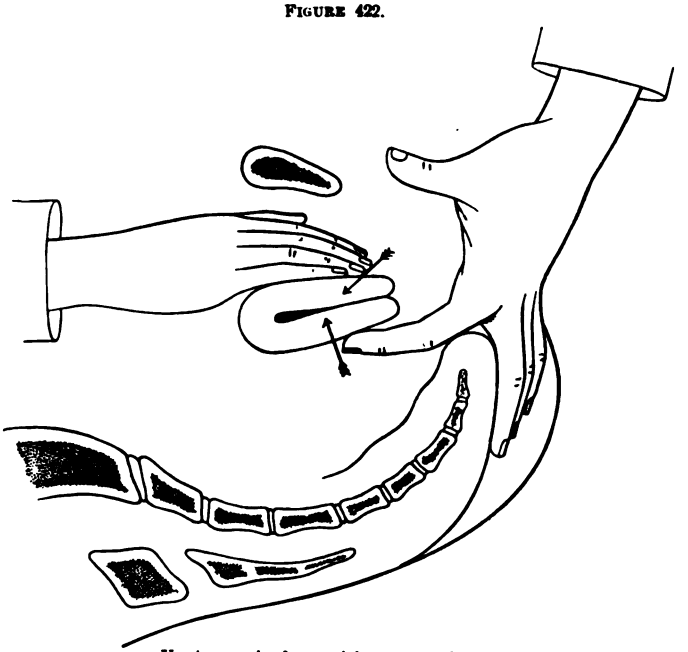
Figures 420–424 are to be taken together, and will serve to explain one of Brandt's methods of replacing a retroposed uterus. The patient is in the Brandt position, Figure 16. The uterus is long and flexible, and somewhat fixed. The left index-finger, in the posterior vaginal fornix as high as possible, raises the uterus toward the abdominal wall—Figures 420 and 421—while the fingers of the right hand above the symphysis press down on the cervix, the point of pressure being as nearly as possible the plane of the internal os, Figure 422. The left index-finger, then leaving the posterior, passes to the anterior fornix and approaches the fingers of the right hand, Figure 423. Both hands, acting together, push the cervix upward and backward, while the uterus tends to fall over slightly forward.

FIGURE 421.

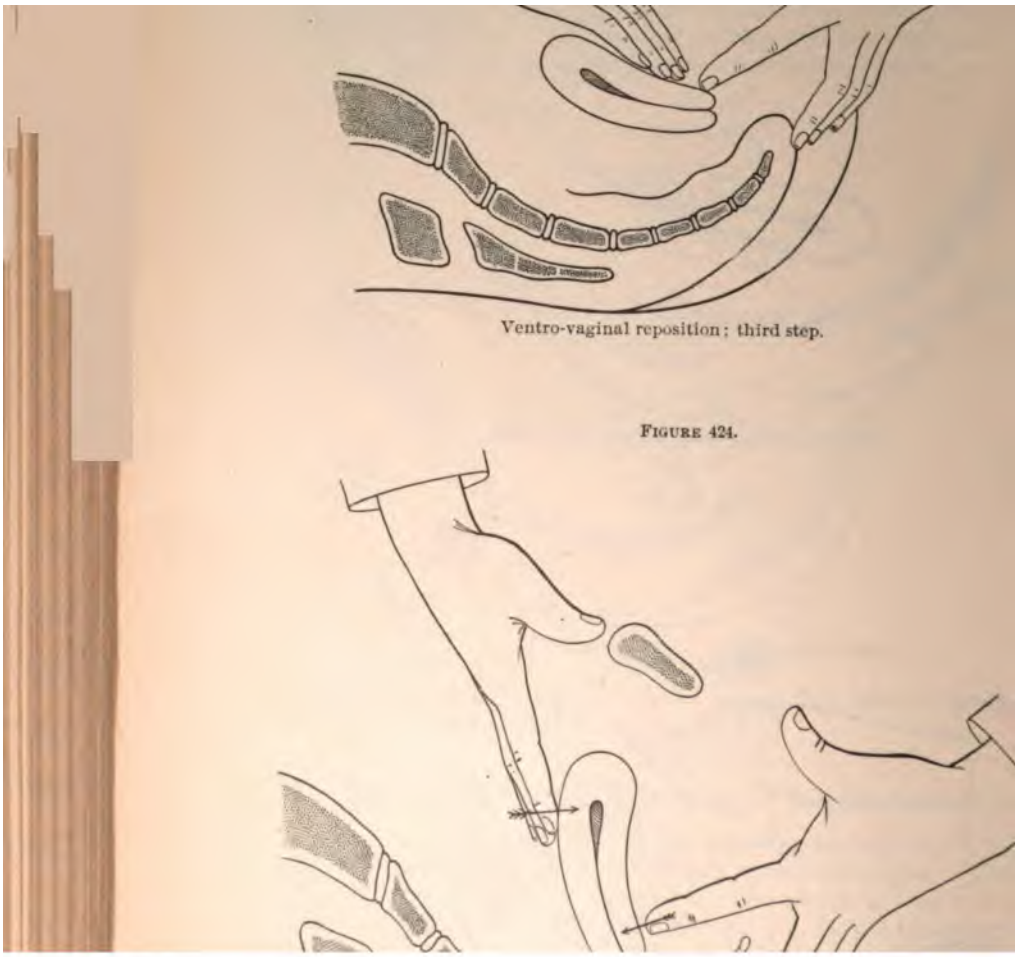


Ventro-vaginal replacement; end of first step.

FIGURE 422.



Ventro-vaginal reposition; second step.



Ventro-vaginal reposition; third step.

FIGURE 424.

Then, while the left index-finger is kept fixed, the fingers of the right hand are passed lightly along the right border of the uterus until they pass the fundus, which they then press forward, Figure 424. The organ then lies extended along the left index-finger. It is essential for the success of this manœuvre that the uterus be kept always in the median line, or that in the replacement it be swung around slightly to the left.

Manual Ventro-recto-vaginal Reposition of the Retroposed Uterus.

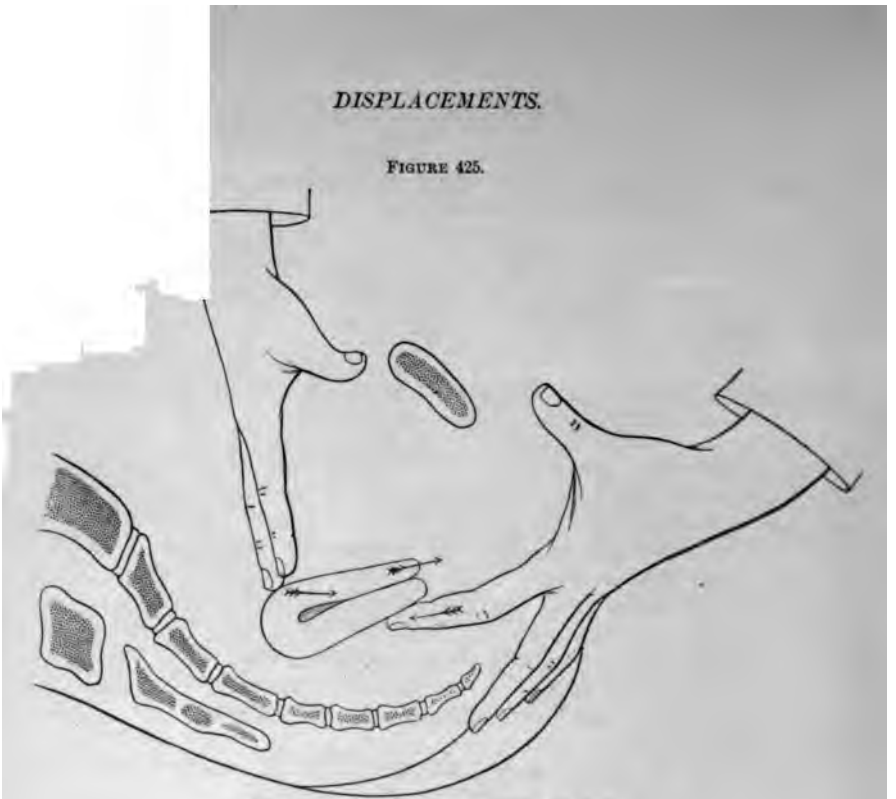
This method of replacement is illustrated by Figures 425–427. It is indicated when the retroposed uterus is long and soft. The left index-finger, high up in the rectum, pushes the fundus forward, while the right hand on the abdomen executes some circular and vibratory movements. As the muscles relax, the external fingers approach the fundus and push it downward, so that it may readily be reached by the finger in the rectum; this finger is aided by the thumb in the vagina pressing the cervix backward. The fingers of the right hand, continuing the circular movements, then insinuate themselves behind and under the fundus, and complete the replacement. Figure 427.

The degree to which the manipulations are necessary will depend upon the breadth and strength of the adhesions and bands, and the amount of contraction in the ligaments. Even at the risk of prolixity, it is well, however, to repeat—*All manipulations should be practised only on cases carefully selected according to the indications and contraindications given in* Chapter XXII., *and should be as gradual and as free from pain as practicable.*

The length of time that should elapse after an acute inflammation before manipulative reposition may be undertaken with safety is not less than two months. Pyosalpinx is always a contraindication. The nearer the time to an acute infection the more virulent the pus will be; and, on the contrary, the longer the time the more likely the pus is to be sterile. If therefore on account of error in diagnosis the manipulative movements should rupture a purulent tube and force the contents of it into the abdomen, the danger of peritoneal infection would be decreased directly with the length of time that had elapsed since the acute attack. In chronic hydrosalpinx the fluid is usually sterile, and is therefore not a serious contraindication to massage. The practical difficulty is to differentiate hydrosalpinx from pyosalpinx. One may aspirate the tube carefully, and if the fluid prove to be serous and sterile the aspiration may be followed by massage with excellent prospects of cure and restoration of function to the tube. The whole subject of manipulative reposition should be studied in connection with the section on Massage in Chapter XXII.

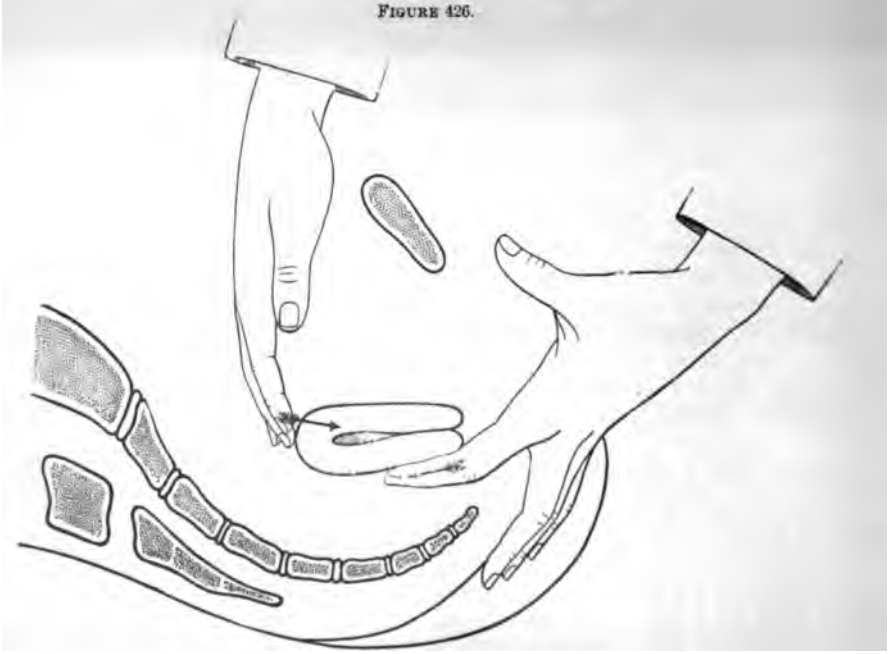
[1] Figures 417–427 modified from Jentzer and Zecgenspeck.

FIGURE 425.



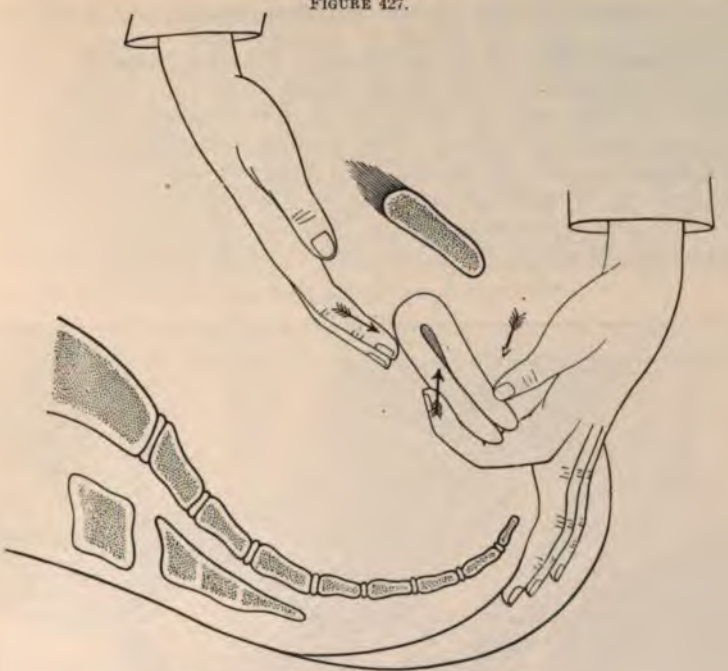
Ventro-recto-vaginal reposition; first step.

FIGURE 426.



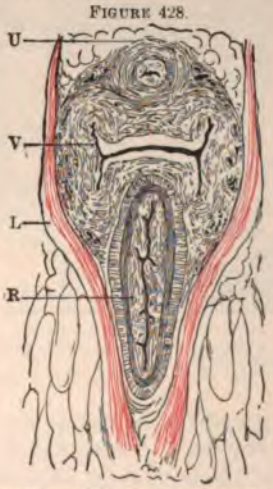
Ventro-recto-vaginal reposition; second step.

FIGURE 427.



Ventro-recto-vaginal reposition; final step.

FIGURE 428.



Transverse section of the lower portion of the vagina; to be studied in connection with Figures 433 and 434.[1]
L. Levator ani muscle. *R.* Rectum. *U.* Urethra. *V.* Vagina.

Means to Retain the Replaced Uterus.

The uterus having been replaced will seldom retain its normal position without artificial support. This support, according to the requirements of a given case, will be secured by means of

Pessaries. Surgical operations.

[1] Henle.

Retention by Pessaries.

Contraindications and Indications for the Pessary. The enthusiast in mechanical gynecology would do well to consider the following: In the majority of cases of retrodisplacement the essential factor is inflammation. The resultant tenderness may render mechanical support intolerable. Adhesions and cicatricial bands may prevent or prohibit replacement, and therefore contraindicate the use of any means designed to hold the organ in place. A tumor or excessive weight of the uterus may carry the corpus backward and

Figure 429.

The common but faulty mode of introducing a pessary, with its breadth turned in the antero-posterior diameter of the vulva. The breadth of the instrument should be in the transverse direction, as shown in Figure 430

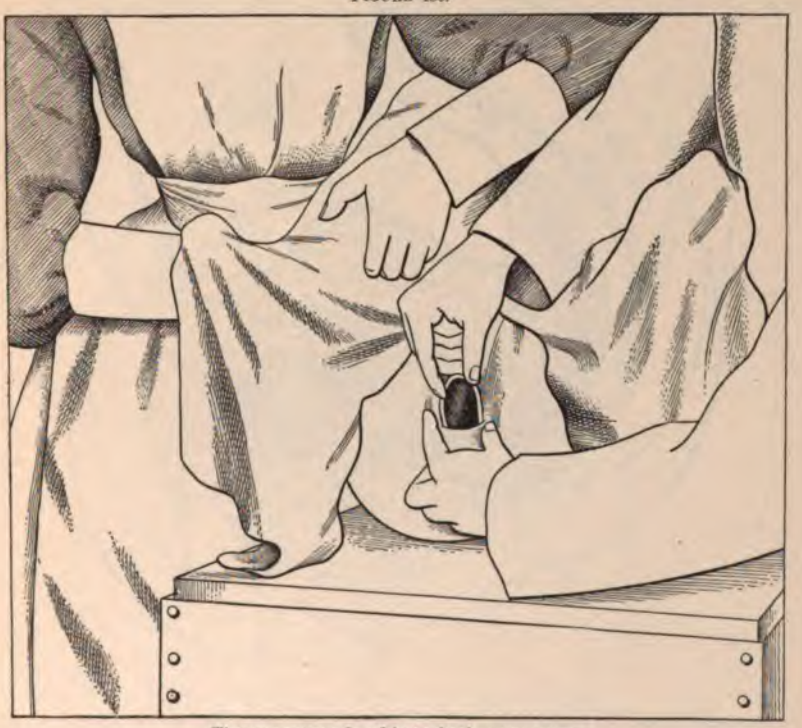
downward with a force greater than any pessary can counteract. The pelvic floor, including the fascial and ligamentous supports of the pelvic organs, may, from subinvolution or other cause, be so relaxed that no pessary can hold the organs in place.

It follows from the above that the field for the use of the pessary must be restricted to those cases in which the displaced organs are replaceable, in which the pessary is capable of holding them in place, and can be worn without discomfort. Failure to recognize and appreciate the contraindication accounts not only for the failures and disappointments, but also for the many evil results which have fol-

lowed the indiscriminate attempts to treat all displacements by mechanical support. The exclusion of unsuitable cases and the recognition of the necessity for accurate diagnosis are apparent. The pessary according to the knowledge, judgment, and mechanical skill of the practitioner, will be useful, useless, or injurious.

The Adjustment of the Pessary.—Figure 429 shows a common but faulty manner of introducing the pessary. The vagina is a collapsed tube, the anterior walls of which rest on the posterior; hence, the long diameter of a cross-section of the canal is from side to side, not antero-posterior. The pessary should, therefore, be introduced with its lateral edges to the sides of the vulva.

FIGURE 430.



The correct mode of introducing a pessary.

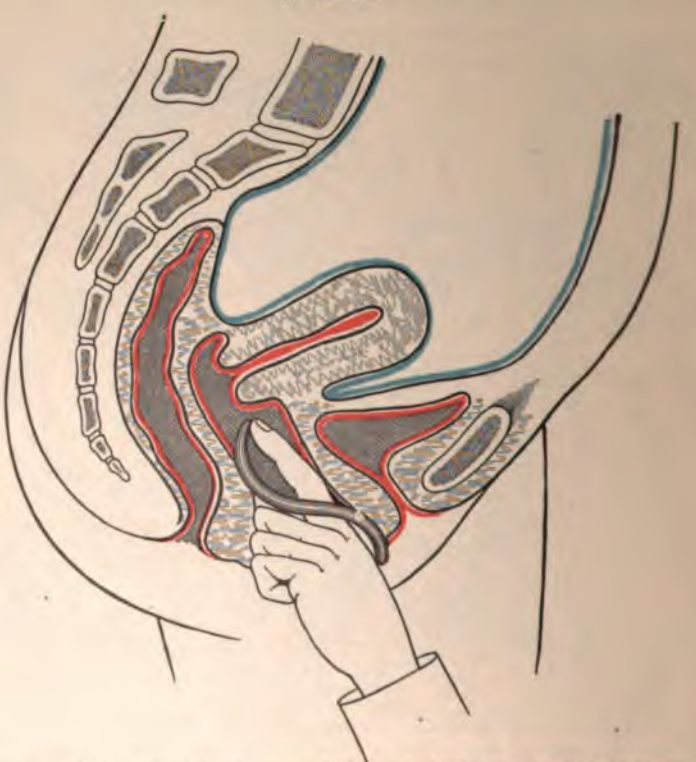
If introduced as shown in Figure 429, with its lateral edges in the antero-posterior direction of the vulva, the pessary is apt to press painfully against the urethra in front and the perineum behind. This pain is increased when the instrument is turned to conform to the vagina, as it must be before it can take its proper place.

In the correct mode of introduction the labia are separated by the thumb and index-finger of the left hand, and the pessary is pushed in with the right hand, its lateral edges being to the side of the vulva; it then readily follows the curves of the vaginal outlet. This mode of introduction requires less force and gives less discomfort. The

first step toward adjustment is complete when the inner end of the pessary is in contact with the anterior wall of the cervix uteri. The second step is to pass the left index-finger, the palmar surface being in contact with the perineum, under the pessary, and push the upper end under the cervix and then backward into its place in the post-vaginal fornix. See Figures 430, 431, and 432.

The curves of the pessary demand careful attention in its application. When the uterus is below the normal level the broad ligaments are necessarily rendered more tense than natural, and the bloodvessels,

FIGURE 431.

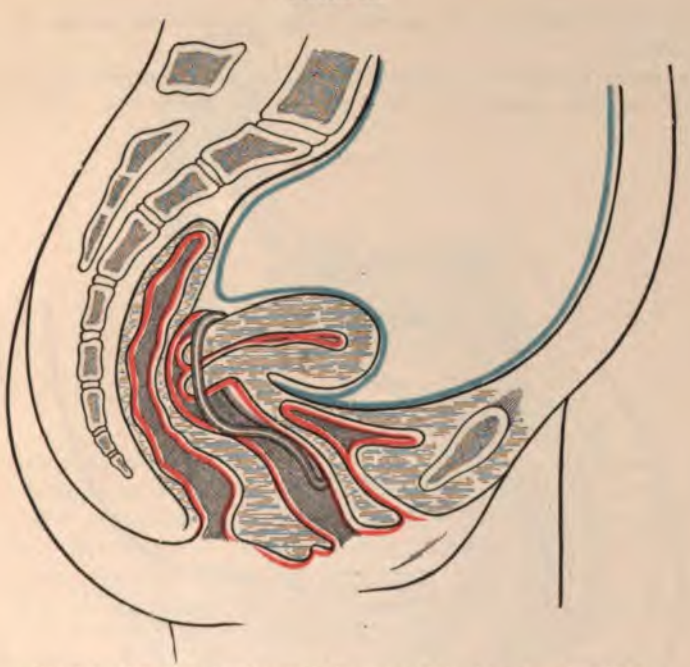


The upper end of an Albert Smith pessary being pushed into place back of the cervix. The apparent lack of mobility at the normal angle of flexure in this uterus is a not uncommon result of the metritis which often complicates retroversion and retroflexion.

more especially the veins, which are looped one upon the other, and which traverse these ligaments to and from the uterus, are made to collapse. This causes venous congestion and consequent increase in weight of the uterus—a condition favorable to malposition, uterine catarrh, and pathological changes in structure. A pessary which will raise the uterus to the health level clearly fulfils an indication. A pessary which raises it above the health level renders the broad ligament tense and reproduces a condition which it was designed to relieve. Maintenance of the uterus upon the health level depends largely upon

the curves of the pessary. The accompanying cuts illustrate the shape and curve of the Hodge pessary as modified by Emmet and Albert Smith. Figure 433 represents the curve of Emmet, and Figure 434 that of Albert Smith. For convenience, let us characterize that curve which rests in the posterior vaginal cul-de-sac as the uterine curve, and that which occupies that part of the vagina adjacent to the pubis the pubic curve. The acuteness and length of the uterine curve determine the height to which the pessary will lift the uterus. The longer and more acute the curve, the higher the uterus will be lifted, and *vice versa*. The smaller curve of the Emmet modification will answer the average indication more nearly than the sharper curve of the Albert Smith modification, which may lift the uterus too high.

FIGURE 432.



Albert Smith pessary in place and uterus maintained in normal position

The pubic should generally be proportioned to the uterine curve—that is, the greater the uterine, the greater the pubic curve. A pessary properly adjusted in all other respects may, by pressure upon the urethra and neck of the bladder, create vesical tenesmus and urethral irritation. This calls for increase in the pubic curve—that is, the pessary should be bent away from the irritated part. The pubic curve may, however, be so great that the lower part of the pessary occupies the centre of the vulva, where it is apt to create irritation. For this condition lessening of the pubic curve is the remedy. The pessary should not be so wide as to distend the vagina. The length

should be measured by the distance from the lower extremity of the symphysis pubis to the posterior vaginal cul-de-sac, less the thickness of the finger. If properly adjusted in a suitable case, it should sus-

FIGURE 433.

The Emmet curves.

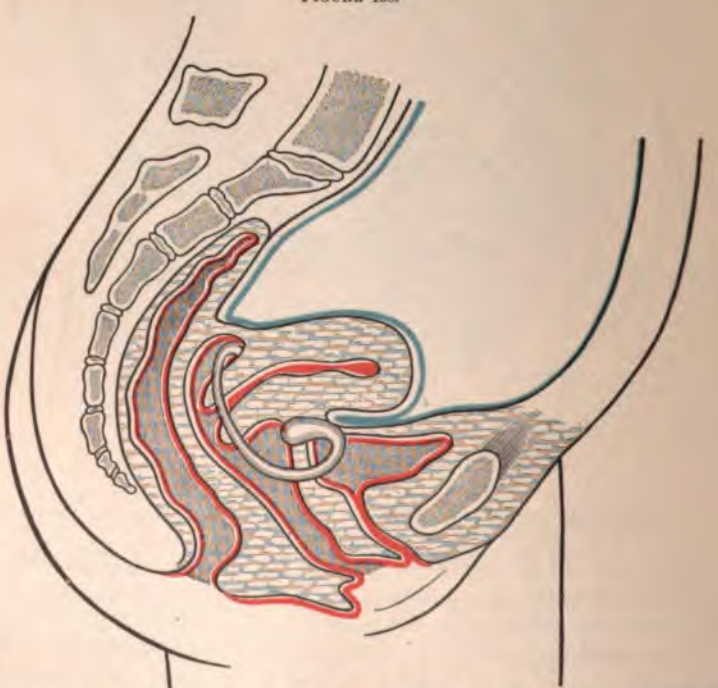
FIGURE 434.

The Albert Smith curves.

tain the pelvic floor in its normal relations and the uterus in stable equilibrium.

Thomas's retroflexion pessary, with its bulbous upper extremity, is a long, narrow instrument of extreme uterine curve. It lifts the

FIGURE 435.



Schultze's sleigh pessary in position. This pessary is not in general use, but is serviceable to hold up the vesico-vaginal wall in cases of cystocele and rectocele.

uterus very high, and is specially applicable in cases of great relaxation of the pelvic floor and of complicating prolapse of the ovaries; the bulbous portion is sometimes made of soft rubber.

The Function of the Pessary is to maintain the uterus not only on the health level in its normal location, but also, if possible, in its normal position, which requires the cervix to be about one inch from the sacrum. The cervix in a properly selected case being thus placed, retroversion is not liable to occur, because if it does occur the fundus uteri will be arrested in its backward course by the over-arching sacrum, and because the direction of least resistance will be forward into the normal anterior position.

It follows that the application of the pessary is based upon the general proposition that *if the cervix be normally placed the body of the uterus will, in the absence of complications, take care of itself.* Since the vagina at its upper extremity is attached to the cervix, displacement of the latter is clearly impossible if the upper extremity of the vagina

FIGURE 436.

Thomas's retroflexion pessary.

be sustained in its normal location. The pessary restores and maintains the relations of the relaxed vaginal walls by crowding the posterior vaginal cul-de-sac backward into the hollow of the sacrum. It also holds the attached cervix within a proper distance from the sacrum, and thereby fulfils its indication by sustaining the pelvic floor. The Hodge pessary, or some modification thereof, answers this purpose in ordinary cases more satisfactorily than any other.

The same general principles—in fact, the same pessaries—which are applicable to prolapse, apply also to retroversion and retroflexion. Indeed, the first step in the genesis of the retro-malpositions has been shown to be prolapse. The student is referred to the general remarks on the adjustment of pessaries for prolapse.

Pessaries designed to prop up the body of the uterus by pressure upon the posterior wall for the correction of the posterior malpositions, and upon the anterior wall to correct the anterior malpositions, are not only unnecessary, but are very liable to induce metritis and perimetritis, and are therefore generally disapproved. In certain cases, however, the vaginal walls, especially the posterior, may be so relaxed from subinvolution and other causes that the instrument, though very long, fails to maintain the cervix in its normal place. Under such conditions an

instrument may be required to act directly upon the uterus. The Schultze's sleigh pessary, represented in Figure 435, fulfils this indication. A long Albert Smith pessary, with its uterine curve made so extreme as to bring the upper part of the instrument in front of the cervix, instead of behind, may answer the same purpose. Expedients of this kind, however, are always of doubtful value.

In retroversion and retroflexion always replace the uterus before adjusting the pessary, otherwise the instrument will press upon the sensitive uterus, and one of three unfortunate results may occur: (*a*) the pessary may not be tolerated on account of pain; (*b*) it may be forced down by pressure from above so near to the vulva that it will fail to do the least good; (*c*) the uterus, finding it impossible to hold its position against the pessary, instead of taking its proper position, may be bent over it in exaggerated retroflexion, with the cervix between the pessary and the pubes, or the whole organ may slip off to one side of the instrument into a malposition more serious than the one for which relief is sought.

A properly adjusted pessary gives to the patient no consciousness of its presence. If the instrument causes pain, it should be removed, and search made for the tender places; it should then, if possible, be remoulded into such shape that it will not make pressure upon them. Often a slight indentation at some point will enable the patient to wear it with comfort. If it cannot be made comfortable, it should be abandoned.

Sometimes when the corpus has been firmly bound back by peritoneal adhesions they may be broken up by very forcible conjoined manipulation under ether; but the operation is dangerous, and should therefore be undertaken only by an expert operator, if at all. The gradual method of local massage, as described in Chapter L., will ordinarily take the place of such forcible replacement.

In certain cases in which replacement is impracticable or impossible, on account of inflammation or adhesions, a soft-rubber ring may be inserted, and will sometimes give decided relief by lifting the uterus and pelvic floor nearer to the health level. In the treatment of all displacements coition should be forbidden until the inflammatory signs have disappeared. The pessary should be kept clean by moderate daily applications of the vaginal douche. Every three or four weeks the instrument should be removed and the pelvic organs carefully examined.

No one can safely apply the pessary until he has fully appreciated its indications and contraindications. Many practitioners are deficient in the natural or clinical skill necessary to its proper adjustment—a fact of which thousands of unfortunate women bear witness. Its dangers in inefficient hands are in striking contrast with its usefulness when judiciously employed in proper cases.

Retention by Surgical Operations.

Many cases of displacement, both anterior and posterior, are so complicated by prolapsed and adherent ovaries, by advanced disease

of the ovaries and Fallopian tubes, by tumors, by inflammatory exudates, or by peritoneal adhesions, that replacement is impossible, or, replacement being possible, the pessary is either intolerable from pain or proves inadequate to sustain the uterus. Such cases, unless relievable by local massage or the topical treatment already outlined, furnish a definite indication for surgical treatment.

Perineorrhaphy, elytrorrhaphy, and the removal of tumors have already been considered under their respective heads. Whenever the perineum has been displaced downward and backward away from the pubes toward the coccyx, its replacement by perineorrhaphy or by some suitable plastic operation upon the vaginal outlet is always indicated; see Chapters XL. and XLI. Elytrorrhaphy is not usually indicated unless the retro-malposition is associated with descent to the second or third degree. If the malposition is caused by a tumor, the pathology, diagnosis, prognosis, and treatment will be those of the tumor.

The surgical treatment proper of the posterior malpositions involves a description and comparison of three recognized operations. Each has its special adaptation to its own class of cases. In the treatment of some cases, according to the individual preference of the surgeon, either one of the three is permissible. The operations are:

1. Alexander's operation, shortening the round ligament.[1]
2. Abdominal hysterorrhaphy.
3. Vaginal hysterorrhaphy.

ALEXANDER'S OPERATION.

The round ligaments, as already explained, restrain the uterus from excessive backward movement. They are two cords, each the size of a goose-quill, springing from the horns of the uterus just below and in front of the origin of the Fallopian tube. They pass forward on either side in the folds of the broad ligaments through the internal inguinal rings, through the inguinal canals and the external rings, and, spreading out in strands, are lost in the mons veneris and upper parts of the labia majora. These ligaments consist of unstriped muscular fibres in condensed areolar tissue. Physiologically they have some contractile power.

When the uterus is retroposed the round ligaments are necessarily stretched to such an extent that they can no longer exert their normal restraining power upon the backward movements of the organ; hence the proposition of Alexander to shorten them extra-peritoneally to such an extent that they will resume their normal functions. This is Alexander's operation.

Indications and Contraindications for Alexander's Operation.

The operation is permissible only when the displacement is not complicated by a tumor, inflammation of the uterine appendages,

[1] A very full paper on this subject is one by George M. Edebohls, in the American Gynecological and Obstetrical Journal, December, 1896. This paper contains an exhaustive bibliography

adhesions, or other impediments to replacement. Clearly, shortening the ligaments could not hold in place a uterus firmly bound down by adhesions or weighted down by a tumor. True, as some advise, the peritoneal cavity might be opened and the adhesions broken up or the tumor removed, as preliminary measures to the shortening of the ligaments; but under such conditions most surgeons would prefer hysterorrhaphy as being the more rational and effective operation. If the uterus can be retained in place by a pessary, or can be successfully treated by massage, or by any of the other non-operative means already described, Alexander's operation, though not a procedure of necessity, may yet be one of expediency. The expediency will, however, depend upon the woman's ability and willingness to carry out the more conservative course. Temporizing measures may insure comfort only so long as she can be free from care, anxiety, and overwork. If she must earn her living, a radical cure by surgical measures may be necessary. After anæsthesia, before the operation is begun, a thorough conjoined examination should always be made, in order especially to exclude inflammation of the uterine appendages; this is because the operation, if made in the presence of unsuspected suppuration in the tube or ovary, may lead to fatal peritonitis.

Preparatory Treatment.

The preparatory treatment is the same as that already laid down in Chapter II., for abdominal and vaginal section. Endometritis is almost always present in the retroposed uterus; hence dilatation and curettage are indicated, and should be performed immediately before the shortening of the ligaments; the reason for this is twofold: first, to cure the endometritis; second, to render the endometrium aseptic, and thereby shut off post-operative infection from that source. Necessary plastic operations on the cervix uteri, vagina, and perineum may, according to the strength of the patient and the rapidity and dexterity of the operator, be made at the same time. If the perineum is injured, its repair is essential to success.

Steps of the Operation.

The steps of the operation are: 1. To find and isolate the ligaments. 2. To draw them out until their superabundant slack has been taken up. 3. To anchor or fix the drawn-out portions by means of suture, in order to keep them from slipping back through the internal ring into the pelvic cavity. The location and extent of the incision and the mode of isolation of the ligament vary with different operators. For example, an incision direct to the external ring was first practised by Alexander;[1] it is, however, often difficult to find the ligaments at this point. J. Frank and Newman[2] cut directly to the internal ring. Kellogg opens the inguinal canal by a small incision

[1] Alexander. London: Churchill, 1884. Hart and Barbour.
[2] American Journal of Obstetrics, 1888.

near the internal ring. Edebohls opens the canal throughout its entire length. The method of Kellogg, with minor modifications, is the one adopted by the writer, and is as follows:[1]

Anatomical Landmarks.

The superficial anatomical landmarks are the anterior superior spine of the ilium, the spine of the pubes, and Poupart's ligament. The deeper landmarks on either side are the external inguinal ring, which lies just above the spine of the pubes; the internal ring, about three inches above, in the direction of the anterior superior spine of the ilium; and the inguinal canal, which lies between the internal and external rings; the rings form the ends of the canal.

The Incision.

The incision through the skin is made midway between the internal and external rings, one inch or more long, parallel to and just above Poupart's ligament; this is directly over the middle third of the roof of the canal. A clean and careful dissection is now made to the tendon of the external oblique muscle. It is important that the natural color and appearance of the cut surfaces be preserved, in order that the exact point of incision into the canal may be readily recognized; hence the necessity of clean dissection and immediate control of all bleeding points by snap-forceps.

The glistening tendon of the external oblique now exposed will usually show a dark line. This line marks a point where the fibres of the tendon begin to separate to form the columns of the external ring. The borders of the separated tendon are connected by the intercolumnar fascia, which, being thinner than the tendon, enables one to see through it to the darker tissues beneath. There may be several narrow points of separation or one broad one. In exceptional cases the separation is absent up to the very border of the external ring. When the dark line has been found, pass the finger down the line toward the pubic spine, and see that it opens into the external ring. This locates the canal. The wound is now drawn widely open by two retractors in the hands of an assistant. The opening in the tissues, overlying the tendon, thus widely separated may be slid about over a considerable area until just the right point for opening the canal is found; it is about three-quarters of an inch below the internal ring. At this point a puncture or an incision, not more than a third of an inch long, is made by a small scalpel through the tendon.

Finding the Ligament.

To find the ligament, take two small hooks, Figure 438, one in each hand. The small opening is made to gape with the hook in the left hand, while the other is passed by the right hand into the open-

[1] The description here given is in the main an extract from the paper of Kellogg: reprint from the Proceedings of the Michigan State Medical Society, 1889.

ing and directly backward, the flat side of the hook parallel to Poupart's ligament and hugging it closely. When the hook has penetrated to a depth of about one inch, its point is turned toward the canal, and the tissues that come in its way are hooked by a wide sweep and drawn up through the slit in the roof of the canal. The little mass of tissue thus brought up will often contain the ligament, but more frequently it is just below the hook and closely connected with the tissue engaged by the hook. A dip with the other hook will bring up the ligament itself. The tissue thus brought into view is a

FIGURE 437.

Two of these retractors are needed for opening the wound.
Full length, 6 inches.

FIGURE 438.

Two of these hooks are needed for picking up the round ligament.
Full length, 6 inches.

grayish-colored mass of fat, which contains anastomosing bloodvessels and the ligament, with its accompanying ilio-inguinal nerve and vessels.

The operator who attempts to find the ligament as Alexander directed, by cutting down through the mass of fat, will find himself embarrassed by the resultant bleeding and the disarrangement of the contents of the canal. He may for hours grope blindly about the region among a variety of structures which marvellously resemble, but are not, the ligament.[1] The earlier operators, who cut directly to

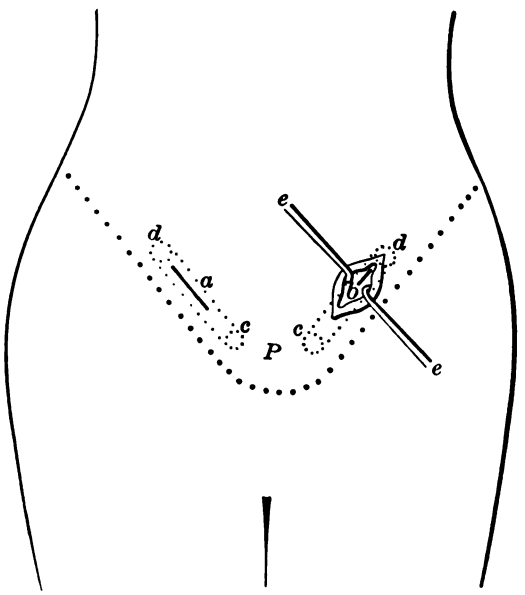
[1] Lapthorn Smith. The Medical News, September 29, 1896.

the external ring, where the ligament spreads out just before passing, fan-shaped, to the pubes and labia, were frequently misled, and therefore often unsuccessful.

Drawing Out the Ligaments.

The mass, having been picked up by the hook, is now spread out on the finger, and the ligament, invested in its fascial sheath, is recognized by its cord-like appearance. On making a longitudinal slit in the sheath, the smooth, glistening pink surface of the round ligament

FIGURE 439.



d, the internal ring; *c*, external ring; dotted lines between indicate the position of the inguinal canal, the dotted lines below indicating direction of Poupart's ligament. *a* shows position of skin incision; *e*, *e* indicate retractors by which the tissues divided by the incision are separated down to the tendon of the external oblique; *b* shows the small incision in the tendon of the external oblique near internal ring; *P*, pubes.[1]

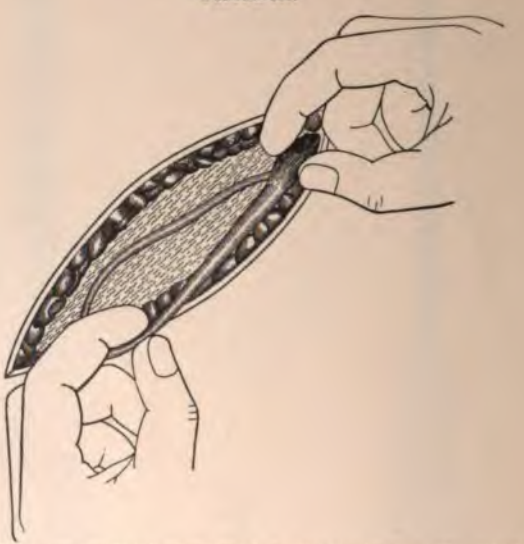
appears. From this time the operation on that side is simple. As soon as the identity of the ligament is clearly established by the fact that it can be "readily pulled out from the direction of the internal ring—that is, made to run"—it is secured from slipping back into the canal by passing a ligature loosely around it and covering the wound with protective gauze, while the ligament on the opposite side is found and exposed in the same manner.

When the ligament is separated from its surroundings it will usually run freely, and this, aside from the eye, is the best test of its identity. Even the eye may be deceived, for in this region are several structures that closely resemble the ligament. If the liga-

[1] Modified from Kellogg. Proceedings Michigan State Medical Society, 1889.

ment is not readily found by the hooks, as described above, they should be introduced again, and, if necessary, yet again. Oftentimes it will be found outside of its sheath, crowded down close to Poupart's ligament at the very bottom of the canal, or it may be at the opposite side of the canal. Give the hook a broad sweep, so as to engage the entire contents of the canal. If necessary, the incision may be prolonged to the internal ring, or another short incision may be made into the canal at the internal ring, after the method of Frank and Newman, and the ligaments sought there. A little patience and care will usually lead to success. Failure to find the ligament is to be attributed not to its absence, but to faulty technique.

FIGURE 440.



Drawing out round ligament and stripping back investing peritoneum from the broad ligament.[1]

The ligament, once found and isolated, will, as has been said, usually run freely. It should be drawn out by gentle, steady traction until it begins to increase rapidly in size and to present a sort of shoulder. This indicates that a point near the horn of the uterus has been reached. At this point the ligament is surrounded by a fold of peritoneum, the canal of Nuck, which is dragged through the internal ring into the inguinal canal. It is well to free both ligaments before pulling them out to the necessary extent. In some cases they are quite small, and therefore, if strongly pulled, are liable to break and retreat into the internal ring beyond reach. By careful and repeated trials, however, they will usually, as they are gently drawn out, become larger and appear as smooth, glistening cords.

The extent to which the ligaments should be pulled out is a matter for judgment; in each case sufficient slack should be taken up to secure the corpus uteri in its normal anterior position. The rapid enlarge-

[1] Suggested by Edebohls.

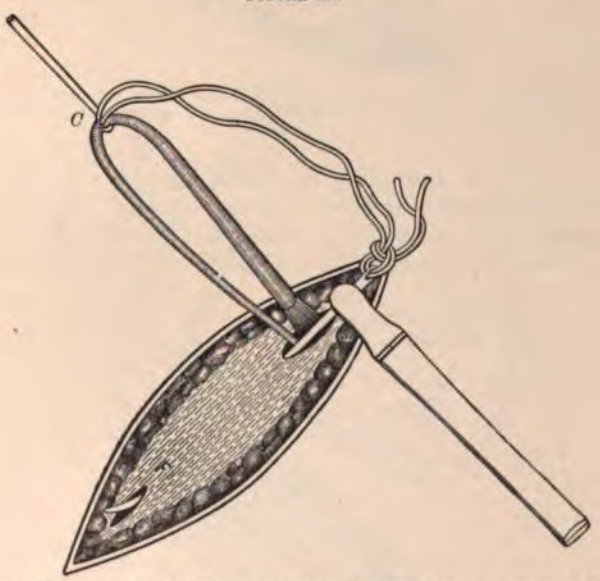
ment of the ligament and the appearance of the canal of Nuck indicate a safe limit.

In separating the ligament and drawing it out, great care should be taken not to injure nor include the ileo-inguinal nerve. Division of this nerve has repeatedly caused anæsthesia of the inguinal region.[1]

Anchoring the Ligaments.

The ligament having been drawn out to the required extent, as shown in Figure 440, the end of its loop at *C*, Figure 441, is transfixed and tied with a ligature. The ends of the ligature are left long, and together threaded into a blunt needle. The needle is then passed under the tendon of the external oblique muscle, and emerges at F, where there has previously been made into the inguinal canal a short slit, through which the loop of round ligament is now drawn. The

FIGURE 441.



The ligament drawn out to the required extent. Ligature passed through the ligament at the loop. Loop being drawn under the tendon of the external oblique, to emerge at the opposite end of the wound.

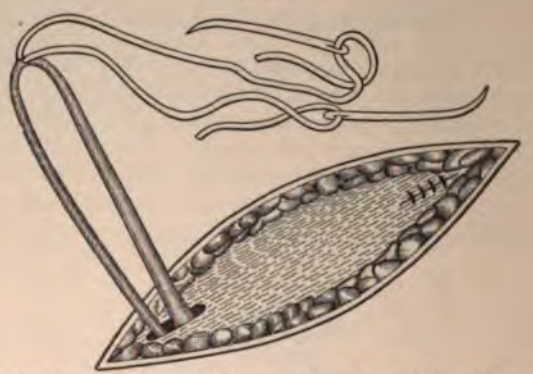
original slit through which the ligament was first drawn out of the inguinal canal is closed with fine catgut sutures and the remaining external portion of the loop is folded down on the tendon of the external oblique muscle, and stitched there in the manner shown by Figure 443.

The two ends of the ligature are then used as continuous buried sutures for the secure anchoring of the ligament and the closure of the wound. The wound closure is similar to that laid down in Chapter VI. for closure of the abdominal wound. Formaldehyde or chromic catgut is used for ligatures and sutures throughout the operation.

[1] Edebohls. American Gynecological and Obstetrical Journal, December, 1896.

It is a safe, though usually unnecessary, precaution during the first month after the operation—that is, until strong healing is secured—to guard against a recurrence of the displacement by means of a pessary. The after-treatment is the same as for abdominal section.

FIGURE 442.



Loop drawn out at pubic end of wound. Original opening into inguinal canal closed with sutures. Two shorter needles now take the place of the single long blunt needle.

The operation for shortening the round ligaments, by folding them on themselves and stitching them together inside of the abdomen, has been proposed and successfully practised in many cases by Palmer Dudley, of New York, and Mann, of Buffalo. This operation is pre-

FIGURE 443.

Loop of the ligament folded down on the tendon of the external oblique muscle, and the two free ends of the ligature passed through at *a* and *b*, to be tied for the closure of the wound.

ferred to that of Alexander when, for any reason, it becomes necessary to open the abdomen. The advantage of Alexander's operation is that it does not require abdominal section. If the abdomen is to be opened, the writer would prefer the more certain method of hysterorrhaphy.

ABDOMINAL HYSTERORRHAPHY.

The object of the operation is to replace the uterus and secure it in its normal position by means of sutures so placed as to unite it with the anterior abdominal wall.

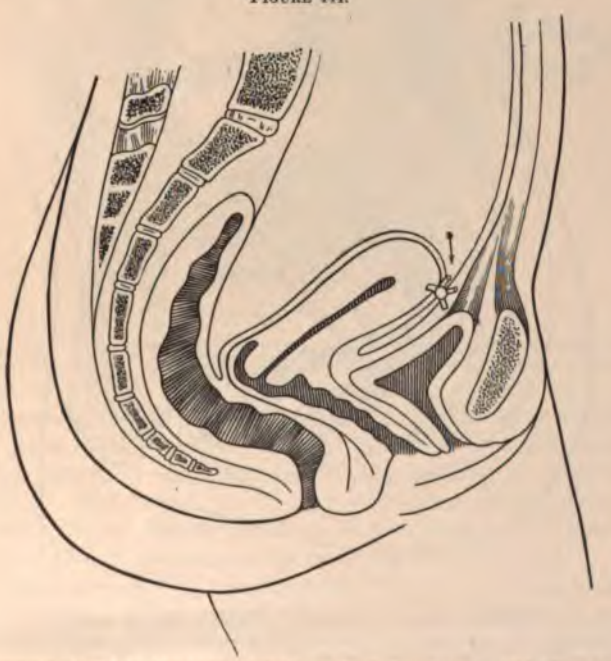
Nomenclature.

Hysterorrhaphy has been known under various names, some of them more or less descriptive of special methods of operation. They are: Ventral fixation, abdominal fixation, suspensio uteri, and hysteropexy.

Impediments to Replacement.

The incision having been made, the left index-finger is introduced into the pelvis and a thorough study made of all the intrapelvic organs. Before the uterus can be replaced adhesions may have to be broken up.

FIGURE 444.



Suture wrongly placed in the anterior wall of the corpus uteri. The arrow points in the direction of the forces that fall on the anterior uterine wall and tend to force the organ back, and thereby to reproduce the displacement.

Tumors of the uterus or its appendages may have to be removed. Conservative or radical operations upon the Fallopian tubes or ovaries may be imperative.

Posterior displacements of the uterus are often associated with salpingitis, ovaritis, and adhesions, which would render mechanical treatment by a pessary or shortening of the round ligaments useless or

dangerous. The occasional failure to recognize these extra-uterine complications accounts for some disastrous results which have followed mechanical treatment and Alexander's operation. The great advantage of hysterorrhaphy is that the peritoneal cavity is open to direct examination and complete diagnosis. The surgeon, therefore, as he proceeds, may avoid unsuspected sources of failure or danger. The very contraindications for Alexander's operation become the indications for hysterorrhaphy. The impediments to replacement and fixation having been overcome or removed, the operation proper—that is, fixation—may be undertaken.

The Conditions of Success.

The sutures should be placed slightly posterior to a line connecting the two horns of the uterus—that is, in the posterior wall. The earlier

FIGURE 445.

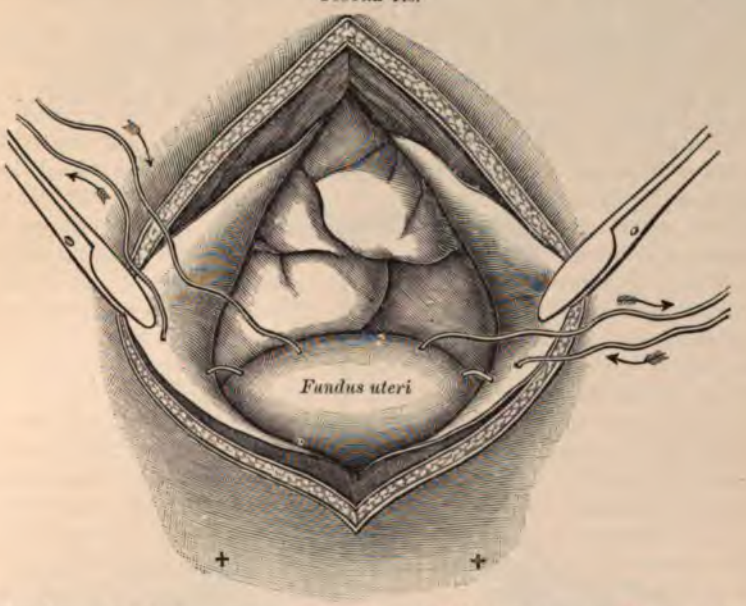
Posterior wall of the corpus properly stitched to the anterior abdominal wall. The arrow shows the direction of forces from above so exerted as to fall on the posterior uterine wall, and thereby perpetuate the normal anterior position.

operators stitched the anterior wall of the corpus to the abdominal wall. By this arrangement the uterus is so placed that contraction of the abdominal muscles and the intra-abdominal forces must be exerted against the front of the uterus, and must therefore, by forcing the uterus back, ultimately stretch or break the adhesions and reproduce the displacement. If, on the contrary, the posterior wall of the corpus be properly stitched to the anterior abdominal wall, all the forces from

above are exerted on the posterior wall of the corpus, and thereby tend to perpetuate the normal anterior position.[1]

Another condition of success is to limit the adhesions between the uterus and the abdominal wall. When the adhesion is to the posterior wall of the corpus uteri, it is surprising how slight it may be and yet make a permanently good result. The object of the operation is not

FIGURE 446.



Peritoneal margins of the wound everted to the outside by snap-forceps. Corpus uteri held steady by a vulsellum forceps, not here shown. Sutures on both sides passed, but not tied.

to fix the uterus immovably to the abdominal wall by broad areas of adhesion; such a result is sometimes produced by numerous deep sutures and extensive scarifications of the anterior or posterior face of the uterus. The broad, unyielding adhesions thus obtained must interfere with the normal movements of the uterus, and thereby give rise to a condition more distressing than the displacement.

Occasional cases of dystocia, some of them demanding craniotomy or even Cæsarean section, bear witness to the danger of excessive uterine adhesions to the abdominal wall. After the operation the adhesions, if properly made, do not remain as such, but stretch out so far as to form a short, ribbon-like band between the uterus and the abdominal wall. This band contains connective tissue and possibly some fibres from the recti and uterine muscles, and is covered by peritoneum; it is therefore a new suspensory ligament designed to supplement the inadequate uterine ligaments. This ligament has been demonstrated by dissection years after the operation.[2] It is usually,

[1] The necessity for uniting the posterior wall of the corpus uteri, instead of the anterior wall, to the parietal peritoneum of the abdominal wall, was first pointed out by Howard Kelly.
[2] Penrose. Diseases of Women.

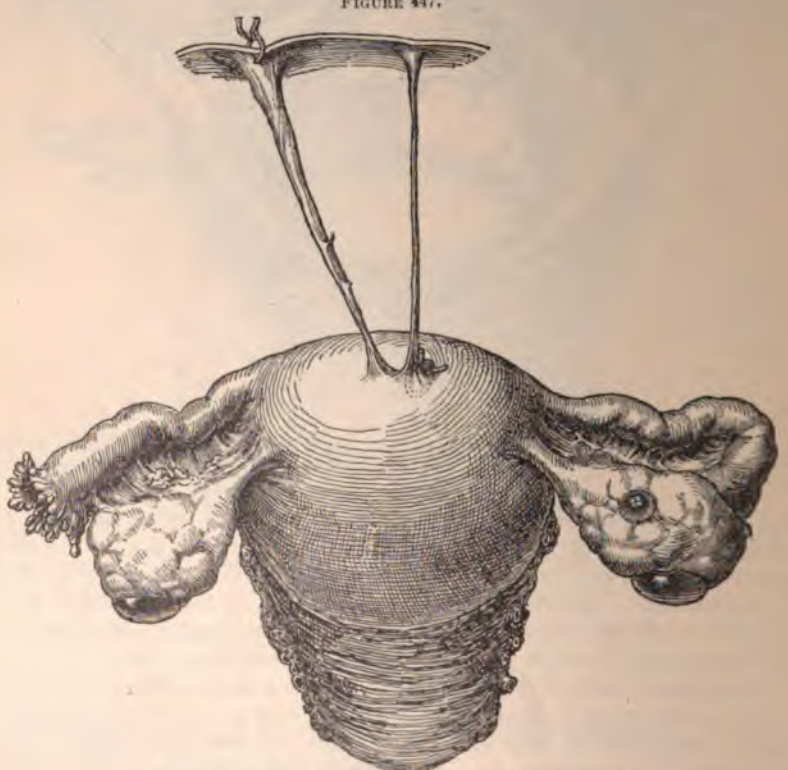
when fully stretched about two inches long. This elongation of the adherent structures into a new uterine ligament cannot occur if the adhesions are too extensive and too strong.

Technique.

The incision, general conduct of the operation, closure of the wound, and after-treatment are the same as for any other abdominal section. See Chapters VI., VII., and VIII.

The introduction of the hysterorrhaphy sutures varies in minor details according to the individual preference of the operator. The writer uses two formaldehyde catgut sutures, one on each side of the posterior wall of the corpus uteri.

FIGURE 447.



Adhesions stretched out to form new artificial ligaments.[1]

An abdominal incision from one to two inches long is made in the median line just above the pubes. The margins of the peritoneum are drawn through the wound over the cutaneous margins, and are held outside by hæmostatic forceps, as shown in Figure 446. The corpus uteri is lifted forward by the left index-finger and middle

[1] After Howard Kelly.

finger introduced through the wound, and is held in place by light vulsellum forceps in the hand of an assistant.

The teeth of the forceps grasp the posterior surface of the corpus in the median line about one-half inch back of the summit of the fundus. The operator, standing on the patient's right, passes a short needle, slightly curved at the point and threaded with fine formaldehyde catgut, into the everted peritoneum on the left side. The needle enters just above the lower angle of the wound, about three-quarters of an inch from the peritoneal margin ; it dips down about one-quarter of an inch so as to include some fibres of the rectus muscle, and emerges about one-half inch from the point of entrance. The needle is then reintroduced into the posterior wall of the corpus to one side of the median line near the horn of the uterus. Care should be taken not to puncture the Fallopian tube. The uterine part of the suture should include sufficient peritoneal and subperitoneal tissue to give it a strong hold on the uterus. The free ends of this suture are now fastened together by snap-forceps and laid to one side. Another similar suture is passed on the opposite side. It is convenient in passing this to do so in the reverse order—that is, to pick up the uterus first and the abdominal peritoneum second. Both sutures being thus passed, a final examination of the pelvic contents is made; and if all is well, the sutures are tied. This secures the upper posterior wall of the corpus uteri to the anterior abdominal wall. The external wound is then closed by continuous catgut suture, as directed in Chapter VI. There is no occasion for scarifying the peritoneal surfaces ; indeed, this should not be done. Adequate adhesion will always form from the presence of the sutures. The pessary is not needed during convalescence.

Immediately after the operation, while the uterus is immovably fixed, there may be some bladder irritation ; but in a few weeks, when the adherent structures have stretched and formed a new suspensory ligament and the uterus has assumed its normal state of mobile equilibrium, the vesical irritation disappears.

VAGINAL HYSTERORRHAPHY.[1]

The purpose of this operation is to anchor the uterus in its normal anterior position by stitching the anterior wall of the uterus to the anterior wall of the vagina.

Operation. Vaginal section is made as directed in Chapter XXIII. The patient is on her back, with the cervix uteri and anterior vaginal wall exposed by means of Simon's speculum and other retractors. The uterus is drawn downward and backward by means of vulsellum or bullet forceps. The anterior vaginal wall is put upon the stretch by means of a small vulsellum forceps fastened to the vagina in the median line midway between the meatus urinarius and the cervix uteri. A median longitudinal incision is then made in the anterior vaginal wall extending from the cervix uteri one inch or more toward the meatus. This incision, which divides the vaginal wall, but does

[1] This operation has passed through numerous modifications, and is still in the transition stage. Among the names chiefly associated with the evolution are those of Schücking, Sänger, Mackenrodt, Dührssen, Byford, and Vineberg.

not invade the bladder, is separated by retractors, the cervix is drawn more strongly forward, and the loose cellular tissue adjacent to the anterior wall of the cervix is stripped back by means of the finger or blunt instrument until the utero-vesical reflection of the peritoneum is reached. See Figures 214 and 215.

A sound in the bladder will distinguish the peritoneum from the bladder wall. The peritoneum, then exposed, is seized with the tenaculum or snap forceps, and divided with blunt scissors. The peritoneal opening is next enlarged by introducing the two index-fingers and tearing and stretching it laterally, or by careful cutting with the scissors. The large opening thus made between the uterus and the bladder will permit the bladder to be pushed up out of the way and the corpus uteri to be drawn through into the vagina and down to the vulva. If there are restraining posterior or lateral adhesions, they may be broken up by the finger introduced through this opening or through a similar one made for the purpose posterior to the uterus. See Posterior Vaginal Section. The uterus, being freed, is drawn into the vagina by successively grasping its anterior wall with two pairs of vulsellum forceps, one in each hand, using first one and then the other, until the fundus finally appears and with it the appendages. Any necessary operation on the uterus or its appendages may now be performed; there may be a small myoma to be enucleated, or some conservative or radical operation to be performed on the uterine appendages. The uterus is now ready to be fastened to the anterior vaginal wall, as follows:

A needle such as would be used for closing the lacerated cervix is threaded with silkworm-gut, and by means of the needle forceps is passed through the flap of the vaginal incision near the urethra, on the patient's left, then continued transversely through the anterior wall of the uterus near the fundus, and brought out through the vaginal flap on the opposite side. Another similar suture is passed immediately below this. These uterine sutures are not tied until after closure of the vaginal incision. The vaginal incision is closed with a continuous buried catgut suture in a manner similar to that described in Chapter VI., for closure of an abdominal wound. The vagina is lightly packed with aseptic gauze and an aseptic dressing is placed over the vulva. The dressings should be changed often enough to keep them clean. After three days the vaginal gauze may be left out, and in its place may be given a daily hot aseptic vaginal douche. The silkworm-gut sutures are removed at the end of four weeks. Formaldehyde or chromic catgut, if used in place of the silkworm-gut, need not be removed at all.[1]

Unless the adhesions between the uterus and the vagina be very broad and very strong, they are liable in a few weeks to give way, with complete return of the displacement. If, on the other hand, the adhesions are sufficiently strong and broad to make a permanent anatomical cure, and pregnancy follows, the danger from dystocia is very great. Numerous cases have been reported, some of them fatal, in

[1] The method described above is similar to that advocated and successfully practised by Vineberg. New York Medical Journal, October 27, 1894.

which Cæsarean section or other grave obstetric operations became necessary for delivery. The operation therefore, as described above, is not approved for cases in which pregnancy may occur.

Vineberg[1] and others have undertaken to overcome the above-stated objections to vaginal fixation, by stitching the slack of the round ligament and a portion of the broad ligament into the vaginal wound. This does not give rise to such broad, strong adhesions as are necessary for success in ordinary vaginal hysterorrhaphy. The immediate results appear to be good. Further observation will be necessary to determine the remote results, especially in their relations to pregnancy and parturition.

The Relative Merits of Abdominal Hysterorrhaphy and Alexander's Operation.

Shortening the round ligament is limited to those cases of slight descent, with retroversion or retroflexion, in which the uterus is replaceable, free from troublesome adhesions, and not complicated by tumors or diseased appendages. The indication is further restricted by the exclusion of cases which can be satisfactorily treated by mechanical support or other less radical measures. The field, therefore, for the operation is not very great.

Abdominal hysterorrhaphy is permissible not only for the above class of cases, but also for a very much larger class. The tumors, adhesions, and inflammations which contraindicate the shortening of the ligaments become at once the indications for abdominal section, to be followed, in case of retroposition, by hysterorrhaphy; hence, the field for this operation is much wider. The greater freedom from dystocia in subsequent pregnancy, however, may finally lead to a preference for the operation of Palmer Dudley or Mann in place of abdominal hysterorrhaphy.

It would be unprofitable to detail the innumerable operations which have been devised and performed in the treatment of the posterior malpositions of the uterus. Some of them are not without merit; some are useless; many are injurious.

In Congenital Retroversion and Retroflexion it is doubtful whether any treatment, surgical or non-surgical, is of the least value. This form of displacement is usually associated with faulty development, both general and local. The concurrent symptoms also are due rather to general than to local causes.

Lateral Versions and Flexions.

The lateral malpositions which often complicate retroversion and retroflexion are usually the result of inflammation in a broad ligament or in the uterus itself, or in both. They are sometimes caused by a tumor of the uterus or its appendages. The treatment is that of the causative inflammation or tumor, and follows the general principles that have been laid down for the treatment of these conditions. Pessaries are of little or no use.

[1] American Journal of Obstetrics, July, 1897.

CHAPTER XLVIII.

ANTEVERSION AND ANTEFLEXION OF THE UTERUS: TORSION OF THE UTERUS.

PATHOLOGICAL ANTEVERSION.

A CERTAIN degree and condition of anteflexion are normal. See Normal Position and Normal Movements of the Uterus, in Chapter XLIV. The evils of pathological anteflexion are more a matter of the associated lesions than of the displacement *per se*.

Sometimes the physiological angle of flexure becomes obliterated in consequence of chronic metritis, and results in permanent straightening of the uterus. The cervix becomes elevated and fixed above, or the corpus depressed and fixed below the normal level. This constitutes pathological anteversion. Figure 448.

Anteversion is associated often with pathological anteflexion. The mobility at the angle of flexure is then increased, diminished, or absent; the flexure is then the significant factor, and will be considered under Pathological Anteflexion.

Etiology and Symptoms of Anteversion.

The causes of pathological anteflexion may be summarized as follows:

1. Adhesions in front of the uterus, drawing the corpus forward.
2. Tumors behind the uterus, pushing the fundus forward.
3. Metritis, increasing the weight of the uterus.
4. Small fibroids in the anterior wall of the uterus.
5. Congenital.

The exaggerated anteversion of early pregnancy is physiological; the exaggerated anteversion of the uterus in chronic metritis is pathological. Elevation of the cervix and depression of the corpus uteri may be induced by peritoneal adhesions. Increased weight from a mural myoma may also depress the corpus.

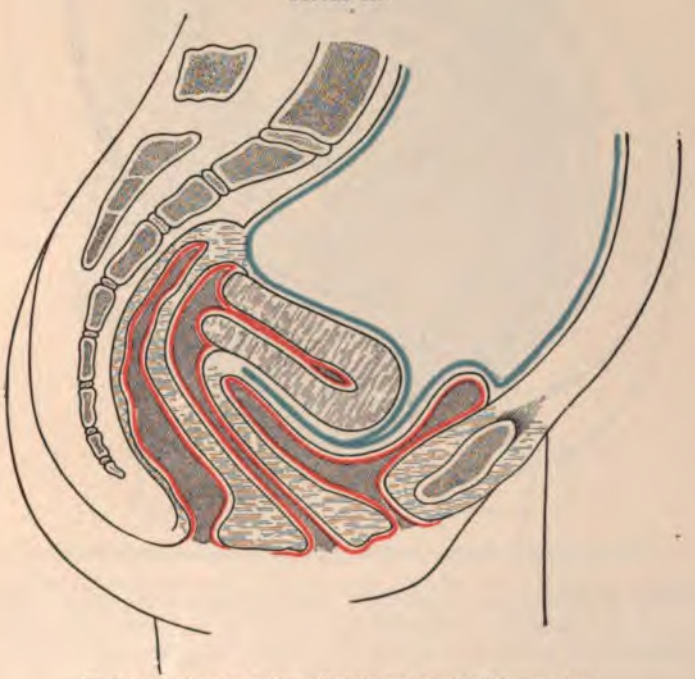
The symptoms are due to the pelvic inflammations and other complications already mentioned. The increased weight of the uterus, which usually is hypertrophied from metritis, generally causes a dragging sensation, especially if the organ be prolapsed. The enlarged corpus occupying the territory of the bladder often induces persistent vesical irritation, or even cystitis. Menorrhagia, when present, is the result of the metritis or of a myoma, rather than of the displacement *per se*. The symptoms usually attributed to

anteversion are usually due rather to the complications than to the malposition.

Diagnosis and Prognosis of Anteversion.

The displacement is recognized by digital touch, which discloses the anterior wall of the enlarged uterus parallel to the anterior wall of the vagina, with the fundus close to the symphysis and the cervix elevated. Conjoined examination will show the size, shape, hardness, and degree of fixation. Exaggerated anteversion of the healthy

FIGURE 448.



Pathological anteversion. Mobility at angle of flexure lost.

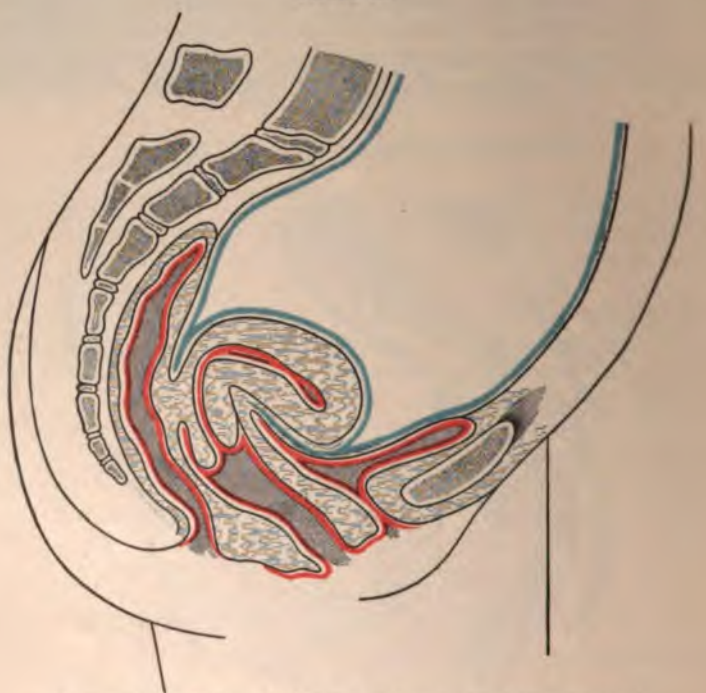
uterus is not necessarily pathological in its results. This is illustrated by the anteversion of early pregnancy. The prognosis is good if the complications can be removed.

Treatment of Anteversion.

If exaggerated anteversion is the position taken by the uterus in chronic metritis, it follows that the treatment is often that of chronic metritis. For the treatment of metritis, perimetritis, myoma, menorrhagia, and other complications and lesions associated with the displacement, the reader is referred to those subjects. Irritable

bladder, which is often a mechanical result of the displacement and enlargement, may sometimes be relieved by means of an Albert Smith or Hodge pessary, which lifts the organ to a higher level away from the bladder. In thus elevating the uterus the anteversion may be increased rather than diminished. This proves that the symp-

FIGURE 449.



Congenital anteflexion; both cervix and corpus uteri bent forward.

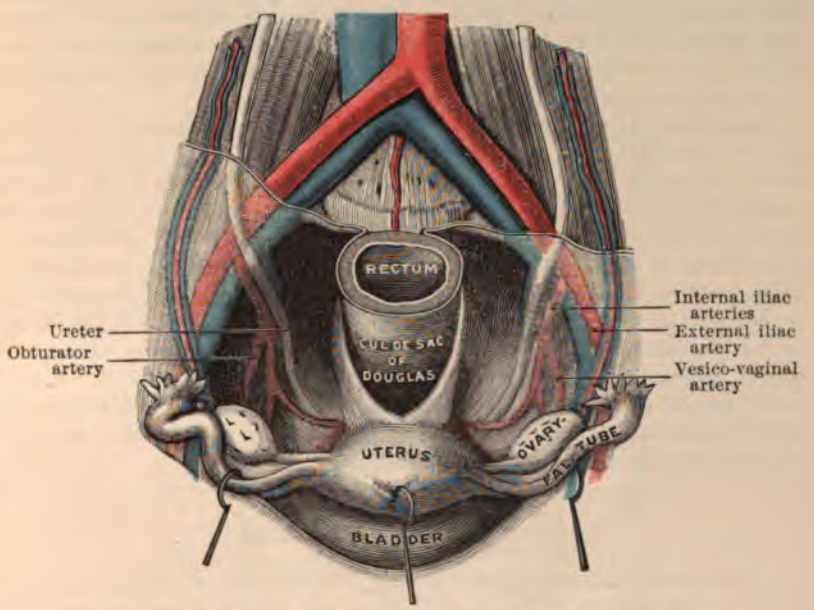
toms were dependent not upon the anteposition, but rather upon descent and antelocation. Should the parts be too sensitive to tolerate the hard-rubber pessary or a flexible rubber ring, the daily application of medicated pledgets of lambs' wool may give support to the uterus and decrease the tenderness until the more permanent instrument can be worn. The numerous anteversion pessaries designed to elevate the corpus by direct pressure on the anterior wall of the uterus generally irritate the organ and thereby aggravate the inflammatory complications. They are, therefore, to be condemned.

PATHOLOGICAL ANTEFLEXION.

A comprehensive study of pathological anteflexion would have to take into account the abnormal conditions usually associated with it; these may have the relation of cause or effect, or be a concurrent result of some common cause.

A distinction between normal and pathological anteflexion would show that an essential factor in the former is mobility at the angle of flexure which permits the degree of flexure to vary within certain defined limits. The limit of normal anteflexion is approximately 90 degrees. The physiological variation is somewhat commensurate with the varying quantity of fluid in the bladder.

FIGURE 450.



The utero-sacral ligaments or folds of Douglas.[1]

The body of the uterus rests upon the bladder, and must rise as the bladder becomes distended. Conversely, if the urine be drawn through a catheter, even while the woman is lying on her back, the corpus, notwithstanding the opposing influence of its own weight, immediately follows the receding wall of the bladder and returns, through an angle of 45 degrees or possibly even 90 degrees, to its accustomed position.

The normal forward bending of the corpus upon the cervix uteri when the bladder is empty makes an angle of which the approximate physiological limits are between 45 degrees and 90 degrees; the flexure, therefore, would generally be pathological if less than 45 degrees or more than 90 degrees. Furthermore, if the flexure, whether it be normal or abnormal in extent, does not disappear upon filling the bladder, but remains constant under all conditions, the rigidity makes the flexure pathological.

Anteflexion is, therefore, pathological if the mobility at the angle of flexure is increased or diminished, or absent.

[1] Testut.

Etiology and Classification of Anteflexion.

Anteflexion may be either congenital or acquired.

Congenital Anteflexion. The uterus is bent upon itself almost double, the body and the cervix both pointing in the direction of the pelvic outlet. The cervix is somewhat elongated and situated in the long axis of the vagina; see Figure 449. By congenital is meant not necessarily defective fœtal development, but failure of the immature child uterus to develop at puberty, a failure which usually pertains alike to the uterus, Fallopian tubes, ovaries, and vagina. A more proper name is infantile uterus.

Acquired Anteflexion may be simply an exaggeration of the normal flexure, due either to increased weight of the corpus from the presence of a myoma near the fundus, or to unequal growth of the uterine walls, or to unequal involution, or to an abnormally soft, mobile condition of the uterine walls. A not infrequent cause of anteflexion is thickening of the posterior wall of the uterus from the products of inflammation, and a corresponding atrophy of the anterior wall from prolonged pressure at the angle of flexure. This condition is apt to be associated with post-uterine inflammation involving the utero-sacral ligaments, a frequent and discouraging complication. Sometimes the inflamed ligaments contract and drag the anteflexed uterus upward and backward, where it may be permanently fixed in its post-uterine location by peritoneal adhesions.

Pathology of Anteflexion.

Peri-uterine inflammations having the relation of either cause or effect to the flexure, often bind the pelvic organs together in a mass of exudate, with resulting failure of nutrition, nerve irritation, and constant pain, which sometimes renders the patient's life miserable and useless. Constriction or collapse of the uterine canal at the point of flexure may, by confining the secretions above, produce inflammation in the body of the uterus, Fallopian tubes, and ovaries. This is analogous to the cystitis, urethritis, pyelitis, and nephritis which follow stricture of the male urethra. As the fecal matter passes the cervix during defecation, force is applied to its posterior wall in the direction of the lower arrow, Figure 451. At the same time fixation of the abdominal muscles, due to straining, whether in urination or defecation, results in a force upon the corpus uteri in the direction of the upper arrow. Thus the flexure is increased and perpetuated with each act of defecation or urination.

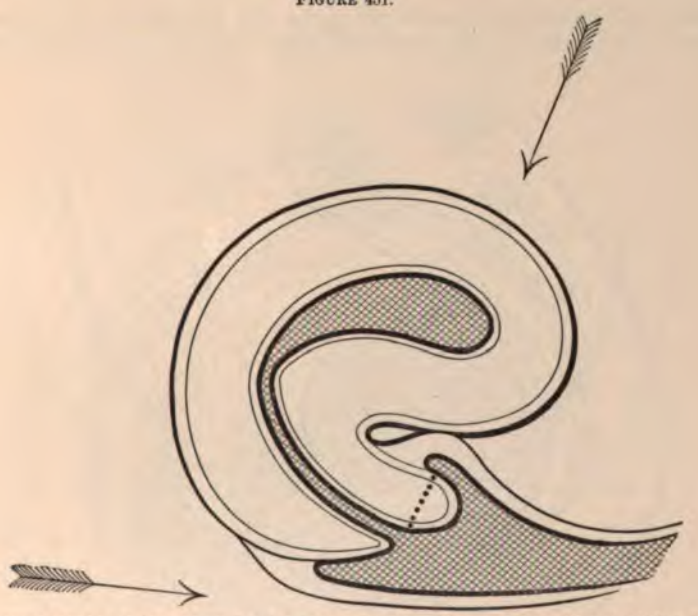
Symptoms, Course, and Complications of Anteflexion.

The numerous symptoms due to the inflammatory and other complications should not be confounded with those that directly depend

upon the displacement. The symptoms of anteflexion may usually be referred, first, to the bladder and urethra; and second, to the uterus itself.

The Vesical and Urethral Symptoms are produced either by rigidity of the uterine tissue at the angle of flexure, which prevents the corpus uteri from rising out of the way of the filling bladder; or by inflammatory shortening of the utero-sacral ligaments, which, by drawing the uterus upward and backward, puts the vesico-vaginal wall on the stretch; this causes traction upon the neck of the bladder and consequent bladder and urethral irritation, and may be the starting-point of cystitis and urethritis.

FIGURE 451.



The arrows show the influence on the displacement of the forces produced by straining at stool.

Vesical irritation caused by post-uterine inflammation and consequent contraction of the utero-sacral ligaments is often wrongly attributed to the mechanical pressure of the anteflexed corpus uteri upon the bladder; this is manifestly impossible, for the contracted utero-sacral supports hold the entire uterus far away from the bladder.

Uterine Symptoms. When the flexure has gone beyond the normal limit and become pathological, two principal results may occur, especially if there be immobility at the angle of flexure:

1. Collapse of the bloodvessels at the angle of flexure, with consequent obstruction of the circulation, passive congestion, and hypersecretion of a vitiated mucus.

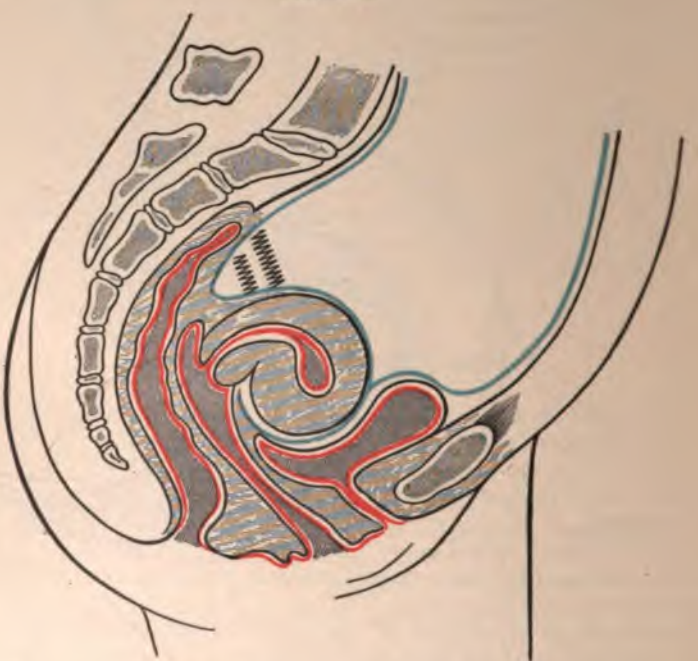
2. Collapse and obstruction of the uterine canal at the angle of flexure, with consequent retention of the uterine secretions. The secretions may decompose and become a potent source of irritation;

the uterine mucosa could then neither produce its normal menstrual decidua nor furnish a safe resting-place for the impregnated ovum. The possible symptom-group dependent upon these two forms of obstruction includes *endometritis*, *dysmenorrhœa*, and *sterility*.

Endometritis may be caused and perpetuated by the endometrial and vascular obstruction. The causation of rhinitis from obstruction in the nasal passages and of cystitis from stricture of the urethra is analogous.

Dysmenorrhœa may depend upon collapse and constriction of the uterine canal at the angle of flexure. This causes the blood to accumulate and to coagulate in the body of the uterus, from which it is expelled at intervals by uterine contractions simulating labor pains.

FIGURE 452.



Acquired anteflexion with post-uterine fixation. Want of mobility at angle of flexure.

The pain, when due to this cause, is therefore always very severe just before the passage of a clot. Dysmenorrhœa may also be caused by similar collapse and consequent obstruction in the veins at the angle of flexure; this causes intense venous congestion of the entire body of the uterus; pain is then due to the pressure of the swollen vessels upon the nerve-filaments and to a consequent irritable condition of the muscular tissue of the uterus. Sometimes the uterine canal becomes temporarily straightened with the establishment of the flow; this removes the cause of the vascular obstruction, and the pain from congestion is

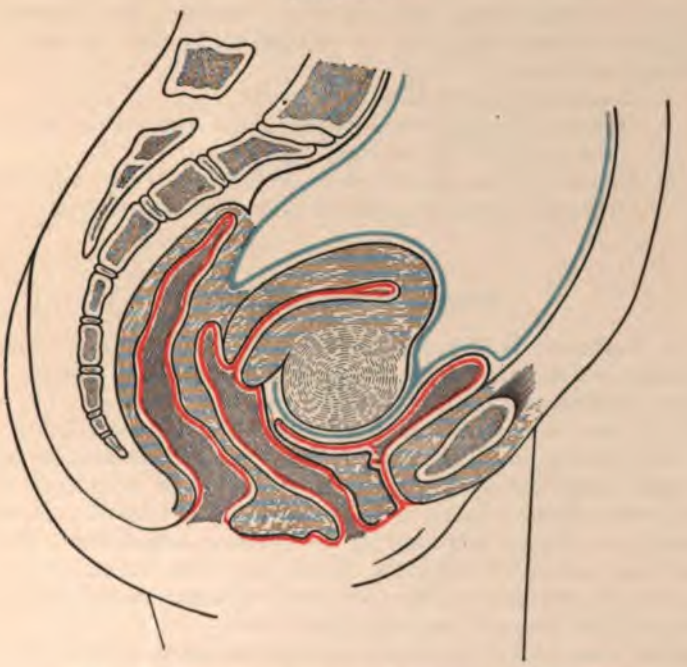
relieved. It is clear that the pain would be intensified in a uterus hypersensitive from metritis, and especially from neuritis.

Sterility is consequent not so much upon failure of impregnation, as upon the fact that the ovum, if impregnated, is unable to survive in the hostile environment of an infected endometrium. It is often maintained that the constriction in the uterine canal *per se* prevents the entrance of spermatozoa, and therefore causes the sterility. This in a measure may be true; but the endometritis which results from the obstruction is the more direct and frequent cause of sterility.

Diagnosis of Anteflexion.

Before the distinction was made between physiological and pathological anteflexion, it was usual to treat all anteflexions as path-

FIGURE 453.



Myoma on the anterior uterine wall, simulating anteflexion.

ological. The reaction came, and with it a universal proposition that anteflexion had no pathological significance *per se;* that it was wholly a question of the associated lesions. But, like other universal propositions, this one was too sweeping; it did not take into account pathological anteflexion.

The educated touch which distinguishes the normal version, flexion, and movements of the uterus will appreciate the anatomical differences between pathological and normal anteflexion. The degree of flexure,

the mobility or rigidity, and the size, shape, location, and consistency of the uterus may be ascertained by conjoined manipulation. The presence of post-uterine inflammation is recognized by the pain caused in drawing the uterus slightly forward, and by the increased thickness and tenderness which may be felt by vaginal or rectal touch in the region of the utero-sacral ligaments. Anteflexion is distinguished from myoma in the anterior wall of the uterus by conjoined examination and the sound. The common error of mistaking the normal version and flexion of a prolapsed uterus for pathological version and flexion has already been mentioned.

Congenital Anteflexion will be recognized by:

1. The small size of the uterus.
2. The small or pin-hole os uteri.
3. The relative lengths of the corpus and cervix uteri; the corpus is one-third and the cervix is two-thirds the length of the entire uterus. The reverse of these measurements is true of the fully developed uterus. See Chapter I.

Acquired Anteflexion will be recognized by one or more of the following conditions:

1. Resisting bands behind the uterus.
2. Downward and forward direction of the cervix uteri in the posterior wall of the vagina.
3. Flexure of the corpus uteri upon the cervix; the angle of flexure is easily palpated in front of the cervix.

Treatment of Anteflexion.

The treatment is directed, first, to the complications; second, to the indications for straightening the flexed uterus.

Treatment of the Complications. If there be inflammation of its surroundings, in the relation of either displacement, its successful treatment becomes impossible; unless treated, it is a contraindication to the treatment of the malposition itself. It may be necessary to remove or to separate adhesions. Incurable complications render all direct treatment useless. Improvement in the treatment of other complications, and in the only resources.

Of the various recognized measures for the direct treatment of itself, it is important to exclude all cases of which would be clearly absurd to treat normal anteflexion as a cause of sterility.

The treatment, when the flexure is pathological, is mechanical, so that:

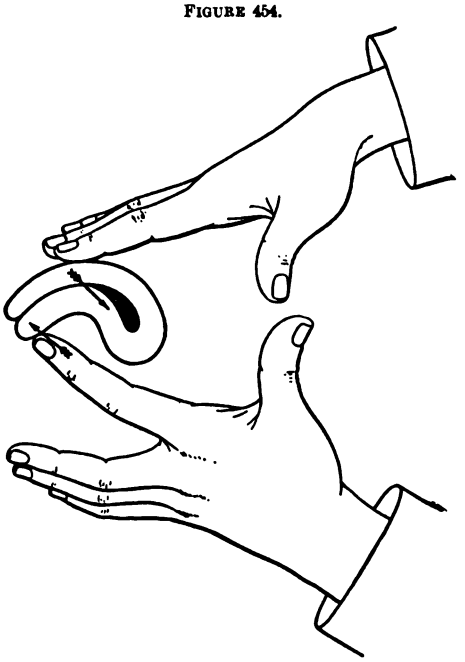
1. Within the range of the forces indicated by
2. Is preserved.
3. The uterus its natural functions as a drain-

The mechanical treatment includes the following measures:

1. The pessary.
2. Local massage.
3. Electricity.
4. Forcible dilatation.
5. Posterior division of the cervix.
6. The author's operation.

1. *The Pessary.* The various anteflexion and anteversion pessaries that have been devised for the purpose of propping up the corpus are almost useless. Their questionable reputation depends upon the relief they frequently give to complicating prolapse, the symptoms of which have been wrongly attributed to anteflexion and anteversion. If pessaries are indicated at all, therefore, they may be used upon the same principle as in descent. See Treatment of Descent. Intra-

FIGURE 454.



Treatment of anteflexion by massage.

uterine stem-pessaries designed to straighten the flexed uterus are sometimes effective—always dangerous.

2. *Local pelvic massage,* is a valuable remedy for the relief of the inflammatory complications, especially those of the utero-sacral ligaments. The treatment consists of pushing the cervix upward and backward with the left index-finger, while with the right hand a forward and downward pressure is exerted on the organ; this converts for the time the anteflexion into an extreme anteversion. The method is illustrated by Figure 454.

When the displacement is associated with dysmenorrhœa the massage may be continued during menstruation, and in some cases with great and immediate relief. It should also be continued for at least a number of weeks.

3. *Electricity* is said by the advocates of it to be a useful agent; it is, however, by no means effective enough to stand alone as the accepted treatment of pathological anteflexion. After considerable personal experience the writer has discarded it.

4. *Forcible Dilatation.* This operation is described in Chapter V; it is indicated in anteflexion with collapsed or stenosed uterine canal and associated endometritis, dysmenorrhœa, or sterility.

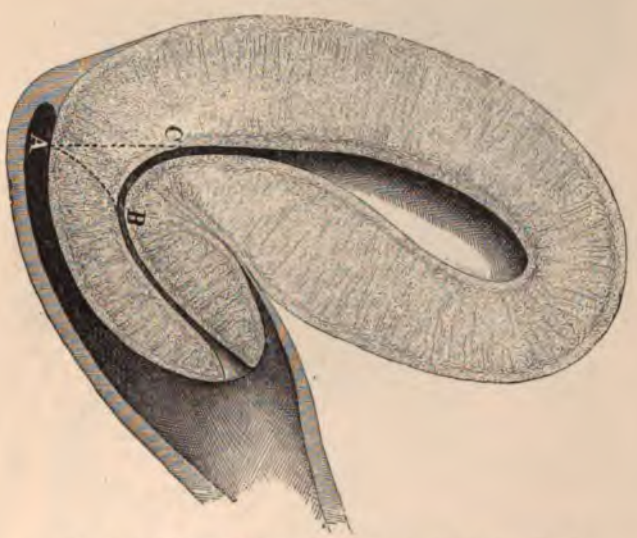
The following is an abstract, with some modifications, of a valuable contribution[1] by Goodell, in which he gives positive indorsement to rapid dilatation as proposed by Ellinger and others. The instruments used are two Ellinger dilators, which are recommended on account of the parallel action of their blades. The dilatation is commenced with the smaller instrument and completed with the larger. The larger instrument has powerful blades that do not spring nor feather. The light instrument has only a ratchet in the handle; but the stronger one has a screw that forces the handles together and the blades apart. To prevent injury to the fundus when the instrument is open, the length of the blades is limited to two inches. The larger instrument has a dilating capacity of one and a half inches, and has a graduated arc in the handles to indicate the divergence of the blades. Goodell's modification of Ellinger's dilator is provided with serrated blades, to keep them from slipping out of the canal during the process of dilatation.

For dysmenorrhœa or sterility due to flexion or stenosis the method of operation is as follows: A suppository containing a grain of the aqueous extract of opium is introduced into the rectum, the patient etherized, and the uterus exposed by Sims' speculum. The cervix is held by a tenaculum, and the smaller dilator is introduced as far as it will go. Upon gently stretching open that portion of the uterine canal which it occupies, the stricture above so yields that when the blades are closed they will pass higher. By repeating this manœuvre a cervical canal is tunnelled out where before not even a fine probe could be passed. Should the os externum or cervical canal be too small to admit the instrument, a pair of pointed scissors may be substituted, and by the same opening and closing motions the canal may be prepared for the introduction of the smaller dilator. As soon as the cavity of the uterus has been entered the handles are brought together. This dilator is then withdrawn, the larger one introduced, and its handles slowly screwed together. If the flexure be very marked, the larger instrument, after being withdrawn, should be reintroduced with its curve in the direction opposite to that of the flexure, and the final dilatation made with the dilator in this position; but in reversing the curve the operator should take care not to rotate the organ upon its own axis, and not to mistake a twist thus

[1] American Journal of Obstetrics, p. 1179, 1884.

made for a reversal of the flexure. The ether is then withheld, and the instrument allowed to remain in place until the patient begins to flinch, when it is removed. The best time for the dilatation is midway between the monthly periods. In the majority of cases the dilatation should be carried to about one and a quarter inches. The infantile uterus that has failed to develop at puberty has thin, unyielding walls, and should therefore not be dilated more than three-fourths of an inch to an inch. In using the larger instrument it is usually necessary to have the assistant make decided countertraction with the vulsella forceps to keep the blades of the dilator from slipping out. The cervix is sometimes lacerated, but not sufficiently to produce unpleasant results. Goodell's statistics include one hundred and fifty operations of full dilatation under ether, with no fatal result and without serious inflammatory disturbance.

FIGURE 455.



Lines of incision in flexion of the uterus. Sims' operation.[1]

After forcible dilatation under ether the cervical canal may remain relatively open and straight, and a symptomatic cure may be effected. Too often, however, the canal returns to its previously angular condition, and the dysmenorrhœa and sterility continue. The comparative safety of forcible dilatation in the hands of a skilful and experienced gynecologist may be contrasted with its great danger when undertaken by a careless septic operator unacquainted with the special requirements of uterine surgery. Peri-uterine inflammation is ordinarily considered a contraindication to the operation.

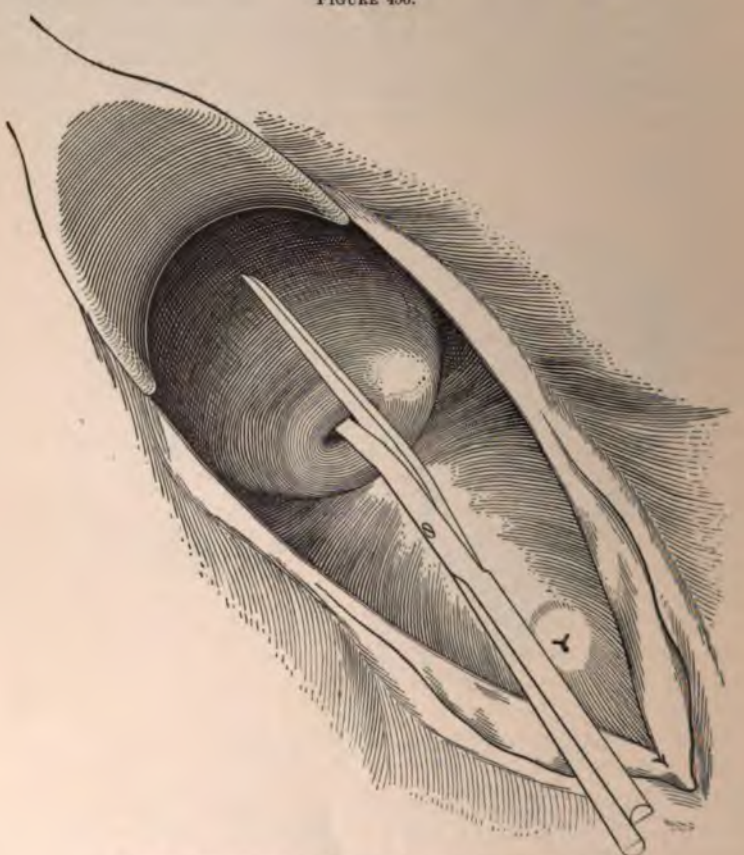
Dilatation by means of tents is transient in its results and dangerous to life. The operation has given frequent and serious warnings,

[1] Emmet. Principles and Practice of Gynecology, second edition, p. 359.

in the shape of pelvic infections, which, if not destructive to life, have been overwhelmingly disastrous in their influence upon health.

5. *Posterior division of the cervix* is an operation devised and once extensively practised by Marion Sims and his followers; it was designed to straighten the uterine canal by making a direct outlet from the point of flexure directly through the posterior wall of the cervix. The operation was not without merit, but it fell into disrepute because, first, it was often done in normal anteflexions; and second, because,

FIGURE 456.



The posterior wall of the cervix being divided by scissors.

while it overcame the obstruction in the uterine canal, it did not straighten the uterus and so relieve the more important obstruction in the bloodvessels. Moreover, the divided cervix was prone to reunite and leave a cicatricial contraction at the os externum. The operation was in the right direction, but was inadequate.

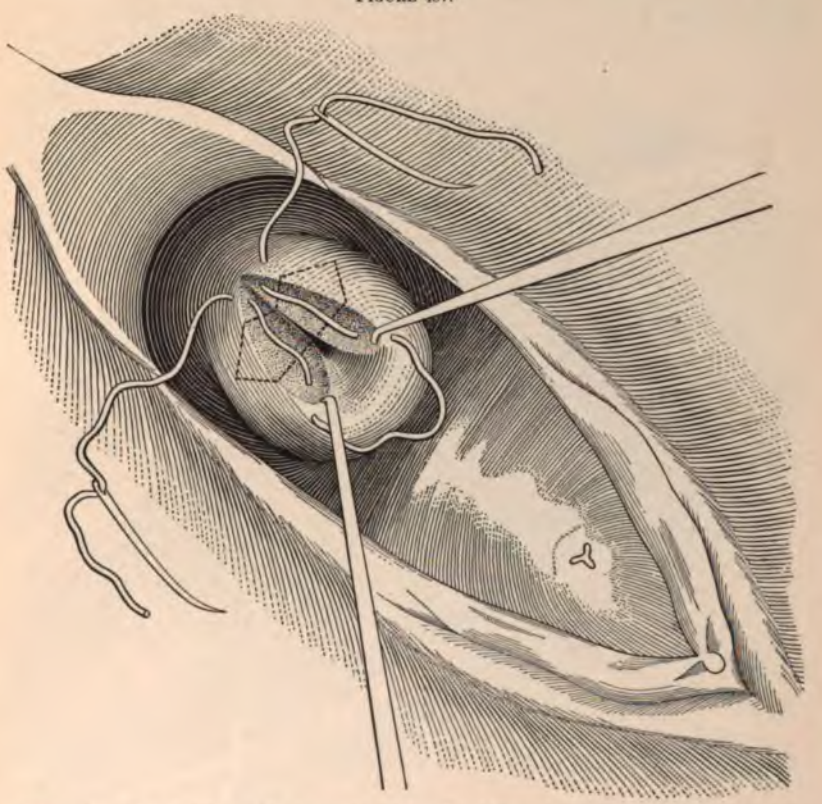
6. *The author's operation*,[1] about to be described, has for its object

[1] E. C. Dudley. "A Plastic Operation Designed to Straighten the Anteflexed Uterus." American Journal of Obstetrics, vol. xxiv. No. 2, 1891.

the utilization of dilatation and of posterior division of the cervix in such a way as not only to enlarge the calibre of the uterine canal, but also to straighten the uterus and thereby overcome the circulatory obstruction. The operation is performed as follows:

Everything connected with the operation has been rendered surgically clean. The patient being under ether, the uterus is exposed by Sims' speculum. The uterine canal is dilated by means of a Palmer dilator, followed by an Ellinger dilator, sufficiently to permit the

FIGURE 457.



The cut surfaces held apart by tenacula. The dotted lines show wedge-shaped pieces to be removed by scissors, in order to make the cut surfaces more readily fold upon themselves. Suture designed to fold cut surfaces on themselves in place, but not tied.

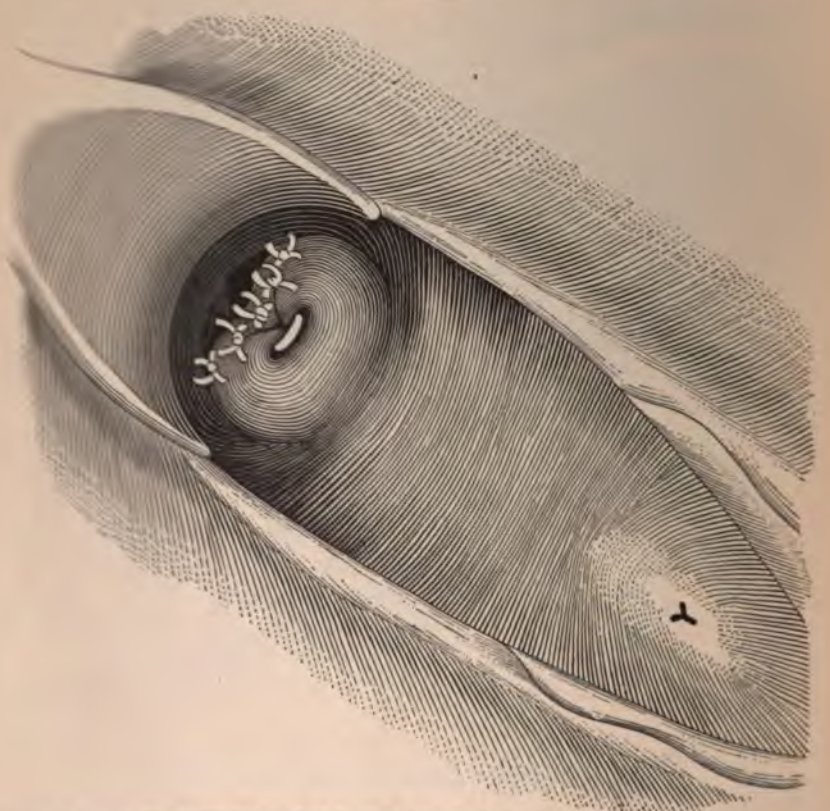
introduction of a small, sharp curette, but not necessarily to the extent advocated by Goodell. Curettage is performed as directed in Chapter XVII. for endometritis. The curettage may give only negative results, and may be, therefore, simply exploratory; or it may give evidence of pronounced endometritis. If the latter, it is imperative as a preliminary aseptic step, not only to the plastic part of the operation, but as a curative measure.

The cervix is divided with scissors backward in the median line

[illegible] attachment nearly to the utero-peritoneal fold [illegible] of Douglas. See Figure 456.

[illegible] surfaces thus incised are then held widely apart by means [illegible] in the hands of an assistant; the incision is somewhat [illegible] by means of a scalpel, especially in the uterine wall next [illegible] canal, and a small angle is cut out on either side, as [illegible] by the dotted lines in Figure 457. The cut surface on each [illegible] folded on itself by a single silkworm-gut suture, as shown [illegible]. This suture is tied and fortified by interrupted su- [illegible] on either side. The lines of union thus made are shown in [illegible].

FIGURE 458.



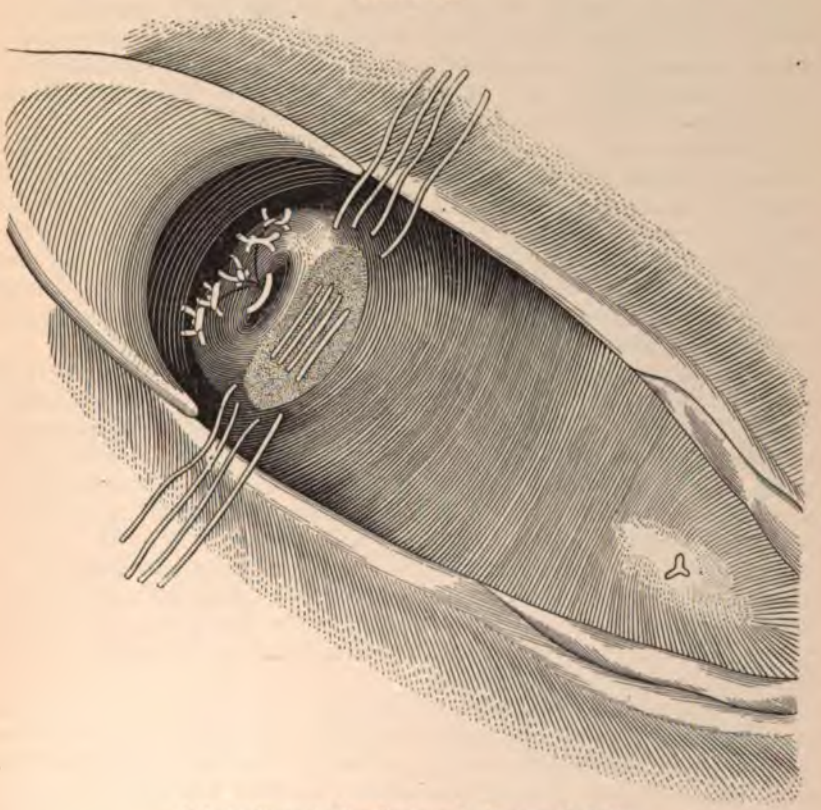
[illegible] shown in Figure 461 tied, and additional sutures designed to fortify this one also introduced and tied. This ordinarily completes the operation.

These sutures are not introduced in such a manner as to stitch the intracervical to the vaginal margin of the wound, but the cut surface is folded upon itself in a direction at right angles to this. On either side that point at the margin of the os externum where the backward incision commenced is stitched to the very angle of the incision, so that each cut surface is folded upon itself, not from within outward,

but from before backward. Thereby the os externum is carried directly back to the angle of the incision. The cervix now points backward in its normal direction toward the hollow of the sacrum, instead of forward toward the vaginal outlet. See Figure 458.

In some cases of extreme anteflexion there is a disproportionately long anterior lip. This elongation is shown by the dotted line in Figure 455. It is the result of a relatively greater pressure on the posterior lip by the posterior vaginal wall; this lip should be caught

FIGURE 459.



Anterior lip excised and sutures in place ready to tie.

with the tenaculum and partially removed by the scissors. The incised surface is then closed upon itself with sutures as shown in Figure 463. The dotted line in Figure 451 shows in section the line of incision through the protruding lip; the incision should extend to, but not into, the os externum. This part of the operation is not required unless the anterior lip decidedly protrudes, and is therefore usually omitted. The removal of a portion of the lip in a suitable case is not only not a mutilation, but it even contributes to the straightening of the uterus.

Conjoined examination upon completion of the operation in each of

the author's cases has invariably shown the uterus either to have been straightened or the anteflexion to have been reduced to a degree quite within physiological limits. The results have been substantially the same whether the point of flexure was at the os internum or below it.

The two posterior lines of sutures have the effect of transplanting the os externum to the very angle of the posterior incision. The anterior sutures, if used, have the effect of carrying the cervix back by a distance equal to one-half the length of the anterior cut surface, which is doubled upon itself. By these means a permanent change, quite equal to overcoming the flexure, is effected in the direction of the cervix. As the result of the anterior portion of the operation, the uterus in a suitable case is lifted also in a higher plane in the pelvis, where it ceases to be a mechanical irritant to the bladder. This portion of the operation may therefore be indicated for descent when complicated with anteflexion.

The writer has not undertaken this operation on the small, undeveloped infantile uterus. The so-called congenital anteflexion is only one factor in a general failure of development, a failure that pertains not to the uterus and other reproductive organs alone, but to the general system. The amenorrhœa or very scanty menstruation and the sterility usually associated with this condition, being only the local expressions of faulty general development, are not reached by any uterine treatment, surgical or non-surgical.

This operation was first published in November, 1890.[1] At that time the writer reported eighteen cases. The results were classified under two heads, one for the mechanical and one for the symptomatic results. The mechanical result was invariably a satisfactory straightening of the uterus. The symptoms were satisfactorily relieved in about three-fourths of the cases. The author's personal experience with this operation now numbers about sixty cases. With this larger experience and larger observation of the symptomatic results he is able to verify the conclusions formed when the operation was given to the profession. In no case has the operation failed to give an anatomical cure. The symptomatic results have been satisfactory in about 75 per cent. of all cases.

The symptomatic indication in the great majority of cases was dysmenorrhœa. This symptom, when the flexure was uncomplicated by peri-uterine inflammation—that is, when the conditions were mechanical—has been quite generally relieved. In seven cases the indication was prolonged sterility. In three of these cases normal parturition has taken place.

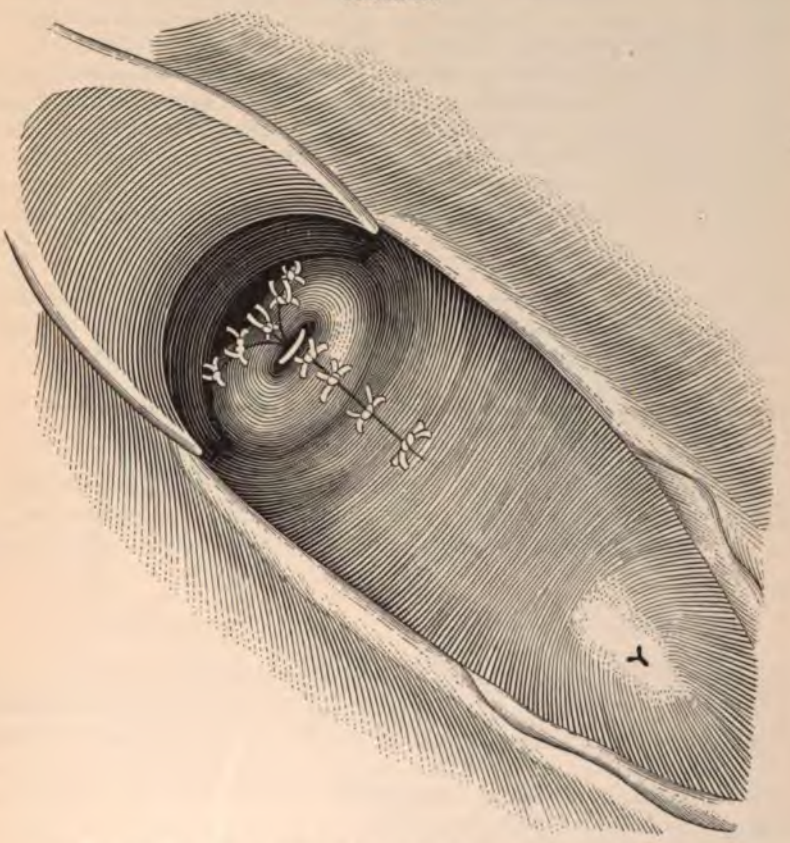
The operation is not presented as a panacea for all the maladies of pelvic origin in which there happens to be a pathological anteflexion. Cases are numerous in which anteflexion is rather an incidental than an essential factor. The hope is that the operation may prove of value when the indication to be fulfilled is wholly or in part mechanical.

There is danger that this operation will be performed indiscriminately in cases not of pathological, but of physiological anteflexion. On the other hand, those who do not consider anteflexion as having

[1] Paper by E. C. Dudley, read before the New York Obstetrical Society, November 18, 1890.

any pathological significance *per se*, and do not always make the distinction between the physiological and pathological position, will fail to appreciate the mechanical indication, and will therefore discard the operation altogether. Clearly a woman might have anteflexion and, if it were normal, might have a large variety of lesions wholly independent of it. To say this, after all, might be only saying that a woman may have a variety of pathological developments in the pelvis,

FIGURE 460.



Sutures tied and operation complete, both on posterior and anterior lips.

and at the same time have the uterus in its normal position. Normal anteflexion could, of course, have no pathological significance.

Since the investigations of Schultze and others, we may distinguish downright pathological anteflexion, in which the uterus is bent to the point of producing two kinds of obstruction at the angle of flexure: 1. Obstruction of the canal from collapse of the canal. 2. Obstruction of the bloodvessels from collapse of the bloodvessels. Under such conditions uterine congestion and catarrh, as pointed out in the foregoing paragraphs, are apt to follow; normal physiological changes can-

[illegible] in the decidua of menstruation or in the decidua of pregnancy [illegible] menstrual disorders and sterility.

The mechanical indication is clear: Straighten the uterus and thereby relieve the obstruction in both the uterine canal and the tubes.

The pessary is but a substitute for dilatation and curettage, but rather supplementary to these two procedures.

The writer has practised extreme divulsion with curettement in many cases of anteflexion; but the results were not very satisfactory. They are, however, more gratifying when the plastic operation already described is added to the dilatation and curettage.

If it is wrong to treat anteflexion mechanically, because it is a result of certain associated lesions, it follows that retroflexion and all other displacements should not be treated mechanically, because they are [illegible] the result of associated lesions. This almost amounts to [illegible].

We have much inflammation of the utero-sacral ligaments as the great associated lesion in pathological anteflexion, and is yet often disappointed in his search for evidence of such inflammation. Inflammation often exists there, but in a large proportion of such cases it has passed away, leaving pathological anteflexion as a permanent result.

TORSION OF UTERUS.

Any part or the whole of the uterus may turn on its own axis; that is, be twisted upon itself; the causes of this displacement are:

1. Anteflexion associated with contraction of one utero-sacral ligament.
2. Retroflexion.
3. [illegible] tumors.
4. [illegible] of the uterine appendages.
5. [illegible]; one horn may lie anterior to the other.

Diagnosis. Torsion of the uterus may be recognized by conjoined [illegible] will demonstrate the anterior surface of the uterus [illegible] not directly in front, but to one side. The long axis of the [illegible] usually found, not in the median line, but having a [illegible] across the pelvis.

CHAPTER XLIX.

INVERSION OF THE UTERUS. HERNIA OF THE UTERUS AND OVARY.

INVERSION OF THE UTERUS.

INVERSION of the uterus is the partial or complete turning of the organ inside out. The difference between partial and complete inversion is simply one of degree. In partial inversion some part of the wall of the corpus uteri, usually the fundus, is depressed into the uterine cavity, but the organ does not protrude through the external os into the vagina. In complete inversion the uterus has turned completely inside out. The inverted uterus is then inside the vagina, or,

FIGURE 461.

Partial inversion.[1]

FIGURE 462.

Complete inversion.[1]

if the vagina is also inverted, both organs will be, to quote Hippocrates, between the thighs, "*velut* scrotum."[2] Figures 461 and 462 represent the incomplete and complete forms of inversion.

Etiology.

More than 10 per cent. of all cases are puerperal. The causes usually assigned are traction on the cord in the delivery of the placenta, traction in the rapid delivery of the child, traction by gravity of intrauterine tumors, or traction exerted in their delivery. These causes, however, are all inadequate to produce the accident unless the muscular walls of the uterus are predisposed by relaxation. Paralysis or great relaxation of the uterine wall is the essential cause of the accident. Undue importance has been given to the various forms of traction; even coughing or sneezing may invert a very relaxed uterus.[3]

[1] Thomas and Mundé. Diseases of Women.
[2] Hippocrates. From Thomas and Mundé.
[3] Adaptation from Thomas and Mundé. Diseases of Women.

Inversion in the majority of cases occurs spontaneously as a direct result of paralysis of uterine muscles. This paralysis may pertain to any part or all of the uterine wall, but is usually most pronounced at the placental site. The paralyzed portion is first depressed into the uterine cavity, so as to give the corpus uteri the appearance of the bottom of a junk bottle. The uninverted portion of the muscular wall, not being paralyzed, may contract and seize the partially inverted paralyzed portion, and push it down further and further until the inversion is complete.

The conditions that most favor paralysis and relaxation of the muscular layers are not wholly known. The accident in about 88 per cent. of all cases is associated with childbirth;[1] hence the inference that the most active causes are connected with utero-gestation and parturition. In a small proportion of cases inversion has followed distention of the endometrium by retained fluids or tumors. The

FIGURE 463.

inversion of the uterus. The inverted organ is in the vagina.

associated with muscular relaxation of the uterus, a result of the relaxation. Finally, we may say in a large proportion of cases arises without definite The accident occurred at the Rotunda Hospital and at the Vienna Lying-in Hospital but once

[1] Playfair and Allbutt. System of Gynecology.

Spontaneous inversion has occurred without the least traction in the virgin uterus, the hymen being intact.[1]

A most instructive case has been recorded by Willard Parker, as follows:

"A young woman, who had borne one child seven or eight years previously, and had never had any recognized uterine disease, while making a violent effort in rolling tenpins suddenly felt something give way within her, after which she suffered the most intense pain and became completely disabled. Dr. Parker, being called to see her, after a hasty examination coincided with the opinion of the attending physician, that a polypus had been suddenly expelled and was hanging in the vagina. Impressed with this belief, he removed the whole mass, when, to his surprise, he found in his hands the inverted uterus with its tubes and ligaments. The patient recovered without any bad symptoms, and subsequently menstruated regularly."[2]

The occasional occurrence of spontaneous replacement of a uterus that had been inverted has been repeatedly observed, and is a fact no less remarkable than spontaneous inversion. In one case replacement occurred while the patient was straining at stool.[3]

Mechanism.

If the entire uterine walls are paralyzed, the organ may invert as the result of traction or coughing or sneezing, or of its own weight. Intra-abdominal force from above may push the paralyzed uterine wall through the os externum into the vagina. If the paralysis pertains to only a part of the uterine wall, the inversion, as already explained, may occur by contraction of the non-paralyzed portion. Clearly, inversion cannot take place when the entire uterine wall is active. It may, however, do so when the paralysis is partial and the activity is partial. Regional paralysis, as already stated, is more apt to occur at the placental site, where the wall is thinner and softer. It more frequently occurs at the fundus or at one of the horns.

In some cases the inversion takes place from below upward—that is, the relaxed cervical portion comes down as in prolapse of the anus. This process begins as eversion, and continues until the whole organ is inverted.

Anatomy and Pathology.

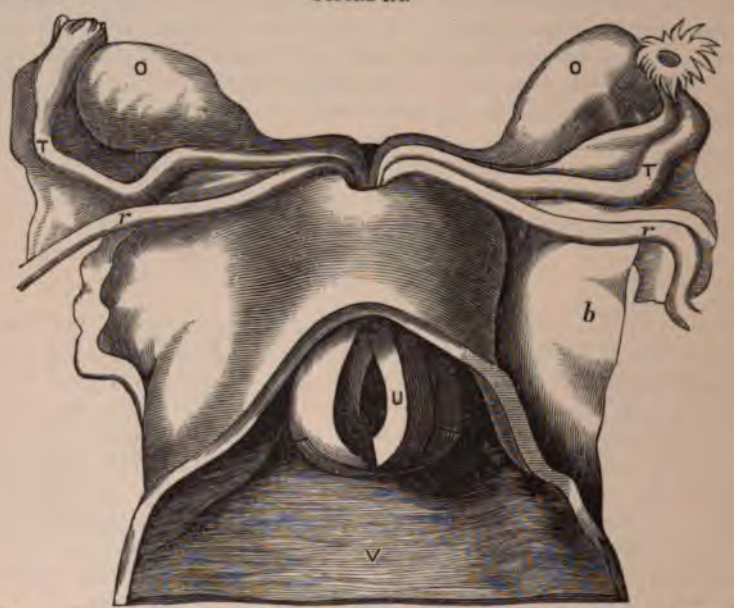
The inversion, if not complete, may have been arrested at any point. Thus the inverted portion may be above the internal or external os; or it may consist of the entire uterus rolled out into the vagina; or, together with the inverted vagina, the inverted uterus may be outside of the vulva. The exposed uterine mucosa is then dark-red or purple from congestion, and there may be regional ecchymosis, erosion, and ulceration. Adhesions have been known to form between the wholly extruded uterus and the vagina. The writer has observed one case in which such adhesions had formed between the partially inverted corpus and the cervical mucosa.

[1] Thomas and Mundé. Diseases of Women.
[2] Loc. cit.
[3] Thomas. Diseases of Women.

There is hemorrhage from the extruded and inflamed uterine mucosa. In the combined inversion of the uterus and vagina the mucosa, after long exposure to external influences, may become dry, wrinkled, and parchment-like, as does the vagina in complete procidentia of the uninverted uterus; the two conditions have been mistaken for one another.

The vessels are strangulated, circulation is impeded, the nutrition of the organ suffers, and some degree of infection is almost inevitable. In rare instances gangrene and sloughing of the inverted portion have taken place.

FIGURE 464.



The inverted uterus, U, lying in the vagina, V, is cut open to show the peritoneal sac, which does not contain the ovaries, O; bristles are passed into the uterine orifice of the tubes; *b*, broad ligament; *r*, *r*, round ligaments; T, T, tubes.[1]

The uterine ligaments, Fallopian tubes, ovaries, and even intestines may at first be drawn into the peritoneal cup of the inverted organ. Rarely these organs become adherent within the cup; usually, however, with returning uterine activity and contraction, they are expelled and remain outside.

Symptoms.

The symptoms of acute complete inversion of sudden occurrence are as follows:

Fixed intense pain.
Profuse hemorrhage.
Shock and collapse.

Partial inversion may occur with no characteristic symptoms, and, without physical examination, may escape notice.

[1] Crosse. Hart and Barbour, Manual of Gynecology.

Chronic inversion may have developed slowly, and therefore been largely chronic from the beginning, or it may follow acute inversion; it causes:

Mechanical disorders of the urinary organs and rectum.
Hemorrhage, more or less profuse, and consequent anæmia.
Bloody, purulent, or serous discharges.
Difficulty in walking and standing.
Pelvic pain.

Nerve exhaustion and impaired health necessarily follow. Life may be destroyed slowly by the exhaustive drain, or at any time rapidly by acute peritonitis. In rare instances, especially after the menopause, there may be only slight inconvenience or none at all.

Diagnosis.

If the abdominal walls are relaxed and thin, and permit adequate palpation of all the intrapelvic organs, conjoined examination will show: first, the absence of a part or a whole of the uterus in the place where it normally belongs; and, second, its presence inverted partially or wholly in the vagina or in the uterine canal. The concavity or peritoneal depression caused by the inversion may sometimes be felt through the abdominal wall. Rectal touch or combined rectal and vaginal touch, with the hand over the abdomen or the sound in the bladder, may facilitate the diagnosis; Figure 23. The finger in the rectum may be made to meet the hand over the abdomen or the sound in the bladder, and thereby demonstrate the absence of a uterus above the vagina. The orifices of the Fallopian tubes, now rolled out and exposed, also may be demonstrable. In case of rigid thick abdominal walls the diagnosis will be more difficult.

FIGURE 465.

Uterine polypus with partial inversion.[1]

The differential diagnosis, in a given case, may raise two questions: First, Is the protruding mass a uterine myoma or polypus, or a vaginal tumor? Second, Is it a prolapsed uterus?

Is it Complete Inversion?	*Is it Myoma or Polypus?*
1. No pedunculated attachment to uterus.	1. Attached to uterine wall by broad surface or by narrow pedicle.
2. Uterine cavity being obliterated, sound can be passed but short distance in incomplete and not at all in complete inversion.	2. Sound passes by the side of the mass through external os far into uterine cavity.
3. Vaginal or rectal conjoined examination shows a ring or depression where the uterus should be, and fails to show the uterus above the vagina.	3. Uterus felt above vagina.
4. The inverted uterus is a symmetrical pyriform body.	4. Not usually symmetrical and may be very asymmetrical.
5. Orifices of the Fallopian tubes usually demonstrable.	5. Not present.
6. Muciparous glands of the uterus present and microscopically demonstrable.	6. Not present, or if present less perfectly developed.

[1] Hart and Barbour. Manual of Gynecology.

Is it Incomplete Inversion of the Uterus?	*Is it an Intra-uterine Myoma?*
1. The uterine cavity as measured by the sound will be diminished.	1. Cavity enlarged.
2. Development sudden.	2. Development gradual.
3. Bimanual examination shows ring-like depression in wall of uterus.	3. Uterus symmetrical or asymmetrical, but no ring-like depression.
4. Usually dates from parturition.	4. No parturition.

FIGURE 466.

Uterine polypus in vagina simulating partially inverted uterus. Adhesions have formed between polypus and os externum.

The great difficulty in some cases of making the differential diagnosis between a polypus or myoma and an inverted uterus is emphasized by the fact that deservedly eminent surgeons have repeatedly extirpated the partially or wholly inverted uterus under the mistaken diagnosis of a myoma. Conversely, the effort has been made to reduce a supposedly inverted uterus when the extruding mass was a myoma. The author personally recalls a case at the Woman's Hospital in the city of New York, upon which such an attempt was persistently made by one of the most eminent members of the visiting staff of that institution.

In rare cases the diagnosis has been obscured by the presence of an inverted uterus in the vagina, and by the coexistence of a subperitoneal myoma of the size, shape, consistency, and position of a normal uterus. The distinction between the two bodies might then depend solely upon the presence or absence of the orifices of the Fallopian tubes in the

vaginal mass. Ordinary care and intelligence, however, will usually enable the surgeon to avoid serious mistakes. Velpeau, quoted by

FIGURE 467.

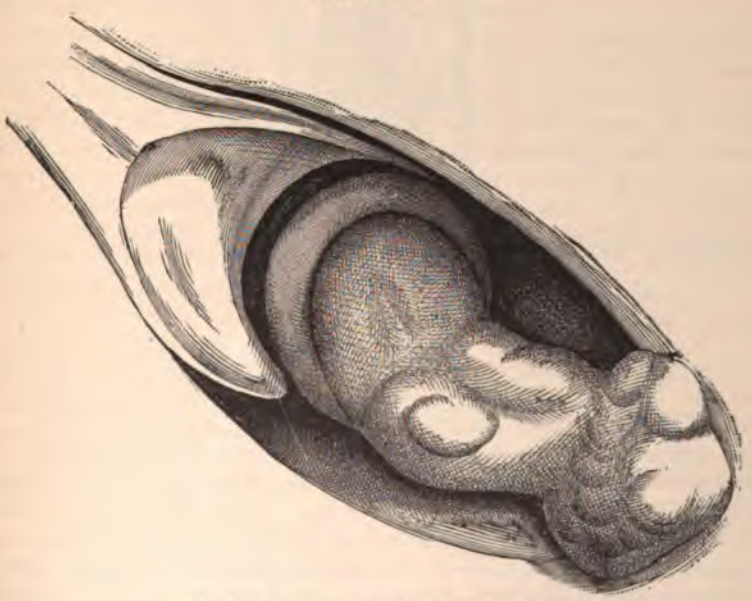
Incomplete inversion of the uterus simulating myoma.[1]

FIGURE 468.

Intra-uterine myoma simulating inversion.[1]

Simpson, once sagely remarked, however, that in some cases doubt is the only rational opinion.[2]

FIGURE 469.



Complete inversion with attached myoma.[3]

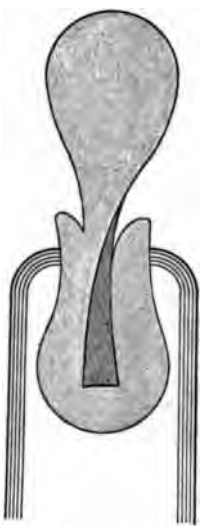
The differential diagnosis between inversion and procidentia uteri will usually be easy.

[1] Thomas. Diseases of Women.
[2] Playfair and Allbutt. A System of Gynecology.
[3] Emmet. Principles and Practice of Gynecology.

Is it Inversio Uteri?	*Is it Complete Procidentia Uteri?*
1. The protruding mass is wider below than above.	1. Mass wider above.
2. External os uteri absent and tubal orifices present at lower end of mass.	2. External os present and tubal openings absent
3. Sound in urethra goes upward into bladder.	3. Sound goes downward into anterior portion of mass.
Exception.—When the vagina is concurrently inverted the sound may pass downward.	
4. Obliteration of vaginal fornices.	4. Obliteration of vaginal fornices.

In the diagnosis and differential diagnosis, inspection and conjoined examination and the sound furnish the most reliable information.

FIGURE 470.



Inverted uterus complicated by a subperitoneal myoma that gives the physical signs of a normal uterus.

Prognosis.

If replacement can be promptly effected in the acute stage just after the occurrence of the accident, the prognosis is immediately good. If replacement be delayed until rigid contraction renders it more difficult, the prognosis will be correspondingly more serious. The possible dangers in acute inversion are from hemorrhage, shock, collapse, and acute infection.

Chronic inversion, unless relieved by replacement, is likely to destroy health—if not, indeed, life—by slow, exhaustive hemorrhages, uterine discharges, and consequent anæmia. Nervous exhaustion from surgical efforts to replace the organ, and the possibility of its removal by mistake for a myoma, are positive sources of danger. Acute infection and peritonitis are among the always dreaded possibilities. Few authentic cases of spontaneous reposition have been recorded.

In rare instances the inverted uterus gives little or no trouble, even when associated with complete vaginal inversion; the uterine and

vaginal mucosa may possibly undergo changes to make them resemble skin, the surfaces becoming hard, tough, parchment-like, and wrinkled. Finally, hemorrhages may cease, and the woman may live to old age in comparative comfort.

Treatment of Acute Inversion of the Uterus.

Puerperal inversion usually takes place in the presence of the attendant between the birth of the child and the delivery of the placenta, and may, therefore, in the acute stage be recognized while the uterine walls are still sufficiently relaxed to permit immediate replacement.

If the placenta is still attached, it should be rapidly removed. The hand is then introduced into the vagina and the fundus pushed up through the cervical canal into place. Strong contractions, with alternating relaxations, are usual in this stage. Reduction by taxis is almost impossible during the contractions. Instead, therefore, of handling or kneading the organ, to reduce its size by contraction, the attendant waits patiently for relaxation, and then makes a steady, firm, and prompt effort at replacement. The whole corpus may be at once carried up or it may be necessary with the finger-tips to indent the fundus at some point, preferably one of the cornua, and let this be the starting-point of the replacement.

Hot water and a fountain syringe, or, better, a Davidson syringe of interrupted current, should be ready, in order that while the hand is still in the uterine cavity a hot douche may be thrown rapidly into the uterus. The hot water, by its stimulating effect, sets up strong uniform uterine contraction; this controls hemorrhage and prevents a recurrence of the inversion. The hot water uterine douche in the control of post-partum hemorrhage acts in the same way. Within a few hours after the accident, firm uterine contraction or retraction takes place in the muscular walls of the inverted uterus. When such retraction is once established, replacement will usually be quite as difficult as if the condition had existed for months—that is, the change from acute inversion to chronic is very rapid.

Treatment of Chronic Inversion of the Uterus.

Until a comparatively recent time the inverted uterus, once contracted, was regarded incurable except by hysterectomy. On the possibility of replacing an inverted uterus after the organ had contracted, the late Charles D. Meigs, of Philadelphia, in his letters to the students of his class, in 1846, wrote: "You might as well attempt to invert one of the non-gravid uteri on my lecture-table as to reposit this one. The time for replacement has gone by."[1]

The Obstacles to Reposition are these:

1. Great rigidity in the contracted cervical ring.
2. Increase in the volume of the corpus uteri from congestion. This occurs soon after inversion.

[1] Emmet. Principles and Practice of Gynecology.

3. Later increased firmness and hardness in the uterine structures from involution.

4. The mobility of the organ and the difficulty of opposing above sufficient counterpressure to the force applied below in the effort to replace.

5. Adhesions, rare but possible, between the sides of the peritoneal cup.

Methods of Reposition. The difficulty of overcoming the obstacles outlined above is apparent from the manifold methods that have been practised by different surgeons. The lesson to be learned from the combined experience of these methods is that success is best attained by firm, steady, continuous, elastic pressure, and that it may finally depend upon very prolonged and patient effort.

The object is to overcome the rigidity in the cervical ring. The pressure to accomplish this may be unyielding or elastic. The treatment includes the following possible procedures:

1. Replacement by the unaided hands.
2. Replacement by the hands aided by incisions or instruments.
3. Continued elastic pressure.
4. If reduction is impossible, the final resort is hysterectomy.

If one method fails, a combination of two or more methods may succeed.

Preparatory Treatment. It is always possible in the course of an attempt at reposition that emergencies may arise that will necessitate abdominal or vaginal section; hence, the necessity of making the preparations as for those operations. See Chapter II. In addition to the above, iron may be required for anæmia, and hemorrhage may be controlled by hot water or aseptic gauze tamponade in the vagina. In a very anæmic case several weeks or even months of recuperative treatment may be essential.

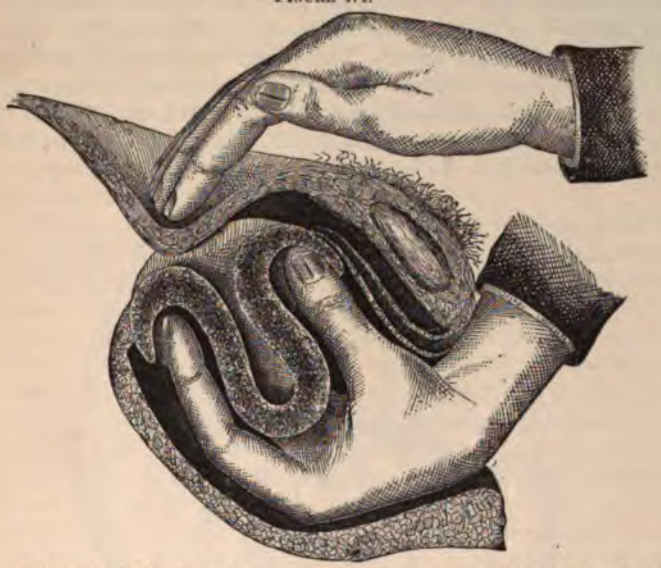
Reposition with the Hands, Emmet's Method.[1] The patient, anæsthetized, is in the lithotomy position. The left hand is passed into the vagina, the fingers and thumb are forced as far as possible into the angle of reflexion, so as to encircle the part of the corpus uteri that is close to the constricted cervical ring. The fundus is in contact with the palm of the hand, and is firmly pressed upward by it, while the fingers are separated to their utmost to open the cervix. At the same time the right hand behind the pubes slides the abdominal wall back and forth over the peritoneal depression. This effort, the object of which is to open out the contracted ring, is continuously repeated. Finally, the rigid cervix uteri may begin to dilate, the corpus may grow shorter, and the extent of inversion may proportionately lessen. After the corpus has been partially forced within the cervix by steady upward pressure, the tips of the fingers are brought together as a wedge, passed through the os, and made to complete the reposition.

Emmet's method is much facilitated by keeping, for a few days previous to replacement, a widely distended Barnes elastic bag in the vagina. The bag is firmly secured by a T-bandage. This dilates the

[1] Loc. cit.

vagina, makes room for the hand, and, by the elastic upward pressure which it exerts, may dilate the constricted ring or even by itself effect

FIGURE 471.



Emmet's method of reducing an inverted uterus by means of the hands alone.[1]

FIGURE 472.

Emmet's method of retaining the partially reposited corpus uteri by closure of the external os with suture. The traction exerted in the direction of the arrows favors reposition.[2]

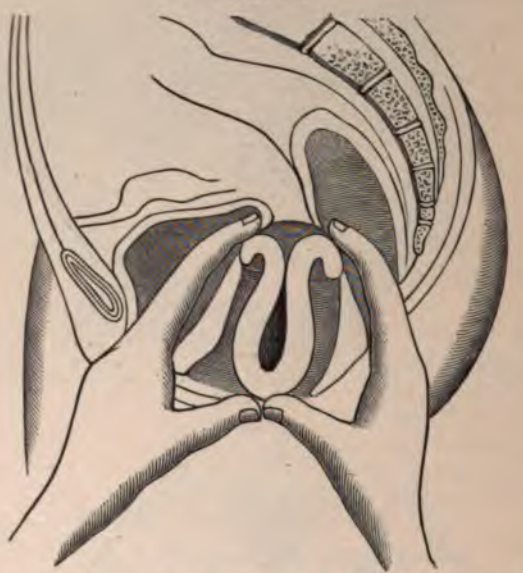
[1] Emmet. Principles and Practice of Gynecology. [2] Ibid.

replacement. In one case complete reposition was made by Emmet's method in three hours and fifty-five minutes.

Emmet further suggests in case of partial reposition, when the corpus uteri has been passed inside the external os, that the progress thus made be secured by closing the external os with sutures. Figure 472.

Tate's Method of Taxis.[1] The index- and middle fingers of the right hand are passed into the rectum, and the index-finger of the left hand into the bladder through the dilated urethra. The balls of the thumbs make constant firm pressure over the fundus, while the fingers

FIGURE 473.



J. H. Tate's method of making counterpressure with the fingers in the rectum and bladder.

in the rectum and bladder make counterpressure against the cervix. In this way great force is applied more directly to the constricted ring than by any other method. In a case of forty years' standing reported by Tate, the thumbs soon indented the fundus, the cervix began to dilate, the corpus was pushed through the cervix, and reduction was accomplished in a few minutes. Were it not for the danger of rupture of the urethra and consequent permanent incontinence of urine, this method would, perhaps, have the preference over all others. Every serious objection could, however, be overcome by opening the vesico-vaginal septum and passing the finger through the artificial vesico-vaginal fistula thus made, instead of through the urethra. The fistula, after reposition, could be closed with little difficulty or loss of time, and with practically no additional danger.[2]

There are numerous other methods of reduction by taxis, but they involve no valuable principle not included in those already mentioned.

[1] J. H. Tate. Cincinnati Lancet and Observer, March, 1878. Emmet.
[2] Suggested by Emmet. Principles and Practice of Gynecology.

Elastic Pressure by the Water-bag or Colpeurynter has already been mentioned in the preparation for Emmet's method. It is called colpeurysis. Reposition may be started by depressing with the fingers one horn of the uterus. The depressed portion, if forced onward, serves as a wedge to dilate the contracted cervix. The hand after a time becomes fatigued and useless. Long-sustained elastic pressure, interrupted occasionally by attempts at manual replacement, may be effective. In many cases elastic pressure alone will suffice. There is, however, no short limit to the time during which it may be necessary to continue it. In some cases reposition has been finally made only after two or three weeks of constant effort.

An effective mode of using elastic pressure is that described by Thomas and Mundé.[1] Through a Sims speculum tampon around the cervix firmly with aseptic gauze soaked in glycerin. This keeps the uterus from slipping out of the line of pressure. Shave the pubes. Introduce a large rubber bag into the vagina and fill it with water. Cut a strip of adhesive plaster two and a half inches wide, long enough to reach from the lumbar region, between the thighs, over the pubes up to the navel. There are two openings in the plaster, one for transmission of the tube of the rubber bag and one for the urethra. The plaster is cut in two just over the vulva, and that portion from the vulva to the anus lined with a layer of gauze. The two parts of the plaster are held together by three safety-pins, and may be opened during defecation or urination; the urine is drawn by a catheter. The pressure may be increased by tightening the plaster or pumping in more water; it may be decreased by loosening the plaster or drawing out water through the stop-cock on the tube. The patient is kept in bed; pain is controlled by opium or morphine.

Continued elastic pressure by colpeurysis is sometimes not tolerated, or it may be contraindicated by the presence of inflammation. Then anæsthesia and more energetic measures may be indicated.

The Spiral Spring, White's Method. A rapid and for many cases effective method of elastic pressure is that of the spiral spring attached to a rubber cup. Emmet's method may be effectively reinforced by the use of this instrument. The patient is anæsthetized. The left hand in the vagina grasps the inverted corpus uteri, and at the same time holds the fundus in the rubber cup. Projecting outward from this cup is a slightly curved rod, having a strong spiral spring attached to its end. The operator's body rests against the spiral, and through it exerts pressure upon the uterus. The disengaged hand is used for counterpressure behind the pubes, as already described in Emmet's method. Figure 474 shows the instrument and its mode of use. Two or more hours of continuous effort may be required to reach the result. Numerous other similar instruments have been devised, but none more effective than this.

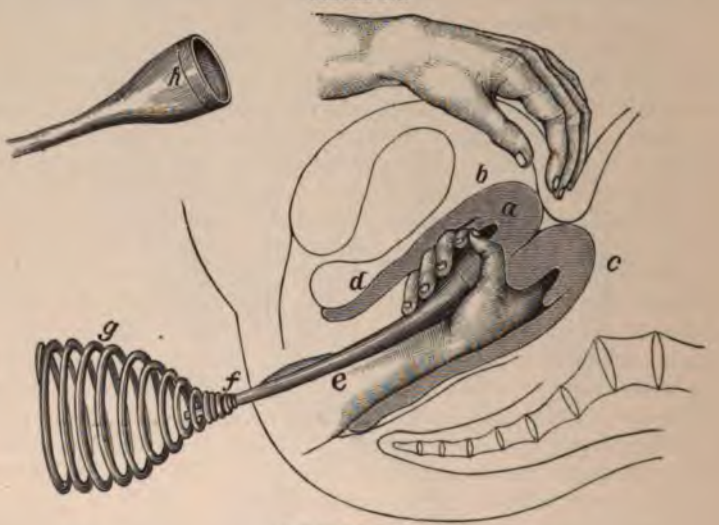
Incision. When the various forms of taxis, supplemented by gradual or rapid elastic pressure, fail, the rigidity of the cervix may be overcome by incision. This plan was suggested by the fact that, after forcible dilatation, the cervix was usually more or less torn, and

[1] Diseases of Women, p. 454.

that an incision would be preferable to a tear. Various forms of incision have been advocated or practised by James Y. Simpson, J. Marion Sims, Barnes, Matthews Duncan, and others. One method is to draw down the corpus and cut nearly or quite through the constricted cervical wall at one or more points, and then reduce the inversion by taxis or rapid elastic pressure. The favorite incisions are one in the anterior and one in the posterior wall of the cervix.

J. Bernard Browne, of Baltimore,[1] makes an incision through the

FIGURE 474.



White's repositor.

fundus. A strong dilator is then passed through the opening into the constricted ring, and the cervix is dilated until the corpus can be forced through into place. Just before reposition, the wound in the corpus is closed with catgut sutures. If the asepsis be thorough, intrauterine gauze drainage may be used in place of closing the opening.

These and similar methods of incision were, before the days of aseptic surgery, regarded as extra-hazardous, and were therefore generally disapproved. Under aseptic conditions, however, the danger would doubtless be less than was formerly supposed. With an aseptic field of operation and thorough gauze drainage in the uterus, the risk should not be greater than for other operations involving peritoneal incisions of equal extent.

The method of Thomas to open the abdomen, and especially that of Küstner to open from the vagina into Douglas's pouch, in order to reach and directly dilate the cervix on the peritoneal side, have fallen into unmerited discredit.

Hysterectomy. If all efforts of taxis, elastic pressure, and incision have failed, the removal of the uterus may become a final resource. The operation would ordinarily be vaginal hysterectomy, and would be

[1] New York Medical Journal, November 24, 1883.

performed substantially as already described for cancer. The writer suggests that after the posterior and anterior incisions have been made from the vagina into the peritoneal cavity, another attempt at reposition be made. Through these openings great force could be applied by the mechanical principle employed in the method of Tate. The fingers should be introduced not into the rectum and vagina, but through the vaginal incisions. Counterpressure could then be most powerfully made direct against the cervical ring.

In treating inversion of the uterus, one should remember that sustained elastic pressure, if long continued, is usually effective and relatively safe, and that more rapid and radical surgical measures are dangerous, and should be used only as a final resort.

HERNIA OF THE UTERUS AND OVARY.

Hysterocele, or hernia of the uterus, is a rare and remarkable displacement. Cases have been reported by Olshausen, Leopold, Rectorzik, Winckel, and Scanzoni, of displacement of the uterus into the sac of a crural or inguinal hernia.[1] In two cases the displacement was complicated by pregnancy, which continued to the fourth month.

The diagnosis is based upon the absence of the uterus from its normal place and the presence of a body answering its description in the hernial sac. If pregnant, the uterus will, until relieved by abortion, progressively increase in size.

The treatment is the same as for any other form of hernia. If reduction by taxis is unsuccessful, herniotomy becomes necessary. This may involve removal of the uterus.

Hernia of the ovary may occur in the same way as hernia of the uterus, and is subject to the same principles of diagnosis and treatment. The author has personally seen but one case; that was successfully treated by herniotomy and removal of the ovary.

[1] Thomas and Mundé. Diseases of Women.

PART VI.

DISORDERS OF MENSTRUATION AND STERILITY.[1]

CHAPTER L.

PREMATURE MENSTRUATION AND PROTRACTED MENSTRUATION.

PREMATURE MENSTRUATION.

It is clear that precocious menstruation could not occur unless the genital organs had developed prematurely; and that absence of such development would leave no data except the flow of blood on which the fact of menstruation could be established. One should be cautious in drawing conclusions from the mere presence of a red stain on the napkin or clothing; such a stain is not proof of menstruation; it may be blood from vulvo-vaginitis, urethritis, or traumatism, or, what is more frequent, from the deposit of red urates.

Development of the sexual organs has, in rarely exceptional cases, taken place long before the age of puberty, and in some instances has been observed at infancy. Perfectly developed mammæ, a full growth of hair on the mons veneris, much development of the external generative organs, and great precocity of the internal organs have been observed in infancy and in early childhood. In many instances of precocious development premature menstruation did not occur; in others it made its appearance several years before the normal age of puberty; and in one or two attested cases apparently physiological menstruation occurred soon after birth.

The appearance of a bloody discharge, even though it be periodical, is not necessarily to be attributed to menstruation. Such a dis-

[1] The disorders of menstruation and sterility are merely functional, and must therefore be considered, not as diseases, but as symptoms. In studying these symptoms, it is essential to consider them from the standpoint of the multiform lesions that cause them. There is scarcely a gynecological disease that may not have relation, direct or remote, with functional disorders. Part VI., in a certain sense therefore, is an index to the whole subject of gynecology. In connection with the study of these disorders, it will be profitable to read the first chapter of the book, which contains a condensed statement of the phenomena of menstruation.

The author is indebted to Edward H. Sauer for valuable abstracts from the periodical literature. Some of these abstracts have been utilized in the preparation of Part VI.

[2] System of Gynecology, Allbutt and Playfair.

charge may occur as the result of tumors, erosions, ulcerations, and other pathological causes, at any period of life, from infancy to old age.

The evidence of many notable examples of early pregnancy is unquestioned; Croom[1] tabulated from the literature a series of twelve cases in which pregnancy, occurring in girls of ages varying from eight to thirteen years, resulted with, one exception, in the delivery of mature infants.

The Causes of precocious sexual development and premature menstruation, especially in infantile cases, are not satisfactorily explained. Among the alleged and authentic causes are: 1, heredity; 2, immoral associations, which viciously direct the attention of the child to the generative organs; 3, masturbation; 4, ascarides in the rectum and other parasites about the external genitals; 5, uncleanliness, especially the deposition of caseous secretions about the clitoris; 6, neoplasm of the generative organs; 7, undue nervous and mental excitement.

The Treatment is implied in the preceding paragraph; it consists in the removal of the cause. The necessity for cleanliness and chastity is self-evident. A young girl prone to precocity should be guarded against all influences that tend to stimulate the emotions or to provoke sexual excitation. The treatment is rather regulative than medicinal; it is chiefly hygienic, and, as such, includes careful attention to diet, exercise, recreation, sleep, and study.

PROTRACTED MENSTRUATION.

The normal menopause usually takes place between the ages of forty-five and fifty years; it may occur earlier, or as late as the fifty-third year; but cessation of menstruation before the fortieth year or the continuance of it later than the fifty-second year would be presumptive evidence of a pathological cause. Apparently normal menstruation, however, has been known to continue until after the age of fifty-seven. The coexistence of ovulation with late menstruation can in a given case only be established by the occurrence of pregnancy; of this occurrence little satisfactory proof has been recorded after the fifty-second or at most the fifty-fourth year. The evidence is conclusive, therefore, that these ages are the practical limit of possible fertility.[2]

[1] Allbutt and Playfair. System of Gynecology. [2] Ibid.

CHAPTER LI.

AMENORRHŒA AND SCANTY MENSTRUATION.

AMENORRHŒA.

AMENORRHŒA is the absence of menstruation. The subject is here restricted to amenorrhœa dependent upon pathological or surgical causes, and will exclude the physiological absence of menstruation before puberty, during gestation and the puerperium, and after the menopause; it also excludes all cases in which menstrual fluid, having been retained by atresia in the genital tract, fails to make its appearance. See Chapter XXXVIII.

Classification.

Two general divisions of amenorrhœa have been recognized: 1. The disorder may be due to absence of the reproductive organs or to failure of those organs to develop from the immaturity of infancy to the maturity of puberty. 2. Menstruation may have been established at puberty, and from pathological causes may have ceased. These two divisions are designated as *primary* and *secondary* amenorrhœa.

Etiology.

The causes may be divided into:

I. Local causes.

II. General causes.

I. **Local Causes.** Chief among the local causes are absence, imperfect development, and atrophy of the uterus and its appendages. The relative extent of these defects may be greater in the uterus and less in the appendages; or greater in the appendages and less in the uterus. Absence or imperfect development of the genitals may coexist with perfect development of the body in general. There are two forms of uterine atrophy: concentric, in which the uterus is much contracted and its canal correspondingly shortened; and eccentric, in which the atrophic process has resulted in a thinning of the walls without decrease in the length of the uterine canal. Concentric atrophy causes permanent amenorrhœa and absolute sterility.

Endometritis and *metritis*, especially when associated with an infectious puerperium, may give rise to atrophy of the uterus and consequent amenorrhœa. See Chapter XVIII. Ovaritis may, as a cause of atrophy of the ovary, produce the same result. Microcystic degen-

eration of the ovaries and ordinary bilateral ovarian cysts are frequently associated with atrophy of the ovary and amenorrhœa.

Atrophy of the uterus and ovaries, especially of the former, has occasionally been observed to follow sharp curettage for endometritis.

II. **General Causes** seldom produce amenorrhœa by acting directly *per se;* they usually do so indirectly, by causing atrophy of the uterus or ovaries, or of both. They may be classified as follows:

1. Acute infectious diseases.
2. Chronic disorders.
3. Nervous disorders.

1. *Acute Infectious Diseases* include scarlatina, diphtheria, typhoid fever, and arthritic rheumatism. The same infection that produces these diseases may also produce atrophy of the uterus or ovaries.

2. *Chronic Disorders.* Among the chronic disorders that cause amenorrhœa are tuberculosis, diabetes, syphilis, anæmia, nephritis, chlorosis, myxœdema, malaria, and exophthalmic goitre. Amenorrhœa associated with these disorders may not be consequent upon atrophy; it may be simply an effort of nature to conserve the blood and strength of a woman whose general nutrition would suffer even from slight menstruation. In some cases anæmia is associated with uterine hemorrhage. See Chapter LI.

3. *Nervous and Mental Disorders.* The psychoses, especially those causing great mental depression, are likely, with or without atrophy of the uterus, to be associated with amenorrhœa. The influence of the nervous system is manifest in the amenorrhœa of prisoners and inmates of asylums. Sudden emotion, chill, and fright have frequently been known, temporarily or permanently, to arrest menstruation.

In addition to the above causes may be mentioned the following: excessive hemorrhage, especially from the genitals; superinvolution of the uterus from prolonged lactation; tissue-change of unknown origin; the morphine-habit; and faulty hygiene, especially such hygiene as comes from insufficient food, overwork, and vitiated air.

Adiposity in anæmic women is often the cause of amenorrhœa; the menstrual disorder, however, often disappears with removal of the cause. The physiological amenorrhœa of the menopause is followed not uncommonly by the deposition of fat.

The amenorrhœa of delayed puberty may occur in girls whose generative organs are apparently well developed. Failure to menstruate in such cases may be due to one or more of the general causes already outlined.

In not a few cases of apparent robust health the patient, for reasons unknown, fails to menstruate.

Removal of the ovaries will arrest menstruation immediately in the great majority of cases. The causes of continued menstruation after double ovariotomy are: 1, the presence of a supernumerary ovary not observed; 2, failure to remove all of the ovarian tissue; 3, failure to remove the tubes close into the horns of the uterus; 4, diseases of the uterus, *i. e.*, endometritis, carcinoma, and fibroids; 5, persistence of habit.

Symptoms.

Absence of menstruation is the prime symptom; associated with this may be numerous disturbances referable to the nervous system; among them, defective vision, ringing in the ears, hysteria, paresis, sweating, and such skin-eruptions as acne, urticaria, eczema, and herpes. Amenorrhœa often is associated with all the symptoms of menstruation except the flow—these symptoms taken together are termed the molimen.

Vicarious Menstruation is an infrequent occurrence. Numerous remarkable cases, however, have been reported in which a periodic flow of blood from some organ other than the uterus apparently took the place of normal menstruation. Such a flow may come from the nose, ear, bowel, or bronchi, or from any exposed surface, such as an ulcer; it may be accompanied by a discharge of milk from the breasts or with diarrhœa. The cause of vicarious menstruation is unknown.

Diagnosis.

Inasmuch as amenorrhœa is a symptom, and not a disease, the object of diagnosis must be to recognize the lesion or lesions that underlie and perpetuate the symptom. These lesions have already been mentioned. Amenorrhœa, especially that caused by atrophy of the ovaries, is sometimes characterized by the presence of a peculiar menstrual molimen, unaccompanied by a flow of blood, but attended with great ovarian hypogastric and lumbar pain.

Prognosis.

The prognosis is that of the lesion that produces the amenorrhœa. Primary amenorrhœa, due to absence of the uterus or ovaries, is permanent. Full development of the rudimentary organs and consequent menstruation have in rare instances been reported; but these reports are not sufficiently definite to have practical significance.

Excentric atrophy of the uterus, that does not decrease the length of the organ, but only thins its walls, may, on removal of the cause and the establishment of correct hygiene, terminate in anatomical and physiological recovery; concentric atrophy, in which the uterus is uniformly contracted, is permanent. As a rule atrophy due to infection, especially to an infectious puerperium, is also permanent.

Amenorrhœa due to prolonged lactation, or to nervous causes, such as sudden fright or violent emotion or chill, offers a favorable prognosis.

In general, the prospect of recovery is good for all cases in which atrophy of the uterus or ovaries is only a participation in a general systemic failure of nutrition. In cases of defective local development and of atrophy due to local causes, especially to infection, the amenorrhœa is usually permanent.

Treatment.

The treatment must vary with the cause. Certain forms of amenorrhœa, mentioned under Prognosis, are permanent, and therefore incurable by any treatment.

The curable cases are usually those in which the uterus or ovaries have, because of some wasting disease, such, for example, as tuberculosis, failed to perform their functions. Amenorrhœa then may, as already stated, be only an effort of nature to save the woman's blood and strength. The ill-health should not be attributed to want of menstruation, but to a general want of nutrition; under such conditions, treatment designed to re-establish menstruation by local stimulation is clearly contraindicated. Such treatment would defeat the efforts of nature and still further exhaust the woman's vitality and strength. The treatment should be not local, but systemic.

Systemic Treatment. It follows, from the foregoing, that the systemic treatment must be that of the numerous causal diseases already mentioned, such as anæmia, chlorosis, myxœdema, exophthalmic goitre, malaria, nephritis, and tuberculosis. Among the most reliable medicinal remedies are iron, arsenic, manganese, the bitter tonics, salines, and mineral waters. Hygienic remedies, such as nutritious food, exercise, rest, bathing, and suitable climate, must have adequate attention.

In amenorrhœa due to obesity and associated anæmia the clear indication is to improve the nutrition by the cure of the anæmia and the reduction of the fat.

The distressing nervous symptoms mentioned in Chapter I., that sometimes follow the menopause, should be treated on general principles. The treatment indicated for these symptoms is the same whether the menopause occurs from natural causes or is artificially produced by removal of the uterine appendages. The ovarian extract in three grain doses, taken three times a day, has apparently given much relief.

Local Treatment is generally useless. In some cases it appears to have been effective; but the improvement probably resulted from general nutritional changes. Pelvic congestion sometimes associated with suppression of the menses may be relieved by rest in bed, regulation of the bowels, hot water vaginal douche (see Chapter IV.), glycerin tamponade in the vagina, scarification and leeching of the cervix. Pelvic anæmia associated with amenorrhœa is an indication for pelvic massage and gymnastics.

Electricity applied to the pelvic organs, whether from the ordinary battery or from the zinc and copper pessary, is of questionable value.

SCANTY MENSTRUATION.

Scanty menstruation, like menorrhagia, is a relative condition.[1] The normal flow may vary for different women between two and six days—that is, a flow of two days' duration, for example, may be

[1] Croom. System of Gynecology, Allbutt and Playfair.

normal for a woman who cannot afford to lose much blood, while for a very plethoric woman a much longer period of flow might be normal. A material decrease or increase, however, in the number of days or in the amount normal for a given individual should give rise to suspicion of a pathological cause. The woman's menstrual habit must therefore be considered in the diagnosis.

The causes of scanty menstruation are identical with those already laid down as the causes of amenorrhœa; the same etiology being established, it follows that the pathology, diagnosis, and treatment must also be along the same lines.

CHAPTER LII.

UTERINE HEMORRHAGE—MENORRHAGIA AND METRORRHAGIA.

MENORRHAGIA.

MENORRHAGIA is excessive loss of blood from abnormally profuse or abnormally prolonged menstruation. Loss of blood from the uterus in the interval between the end of one menstruation and the beginning of the next, whether scanty or profuse, is known as metrorrhagia. Hemorrhage from such causes as placenta prævia, degeneration of the chorion, and inversion of the uterus, is described in works on obstetrics.

The terms menorrhagia and metrorrhagia, although in general use, cannot always be applied with accuracy. The menstrual flow may be prolonged throughout the greater part of the month, or may cease altogether for intervals of hours or days. It is therefore evident that menstrual hemorrhage—menorrhagia—and intermenstrual hemorrhage—metrorrhagia—may be indistinguishable.

Etiology.

Certain disorders which, if present, are apt to cause menorrhagia will be found described more fully in other parts of the book that specially treat of them. Among the more common of these conditions are:

1. Inflammations.
2. Tumors.
3. Displacements.
4. Foreign bodies.
5. Systemic disorders.
6. Visceral diseases.
7. Uterine moles.

1. Inflammations. The inflammatory causes of menorrhagia may be uterine or extra-uterine.

Uterine Inflammations. Chronic glandular endometritis, as described in Chapter XXI., is characterized by enlargement of the glandular and vascular structures of the endometrium, and by consequent excessive glandular secretion or hemorrhage, or both combined. From the pathology, therefore, it is easy to understand that an excessive flow due to endometritis is ordinarily mixed with glandular secretions; that these secretions may form a very considerable part of the abnormal menstrual discharge; and that in some cases in which the disease is more glandular than vascular the discharge may be almost entirely a profuse uterine leucorrhœa composed of vitiated mucus or muco-pus, and only slightly admixed with blood. Such a discharge, if profuse, even though it contains no blood, may be quite as exhausting as if it were of a pronounced hemorrhagic character.

Arterio-sclerosis of the uterine vessels alone has been assigned as the cause of uncontrolable uterine hemorrhage by Herman, August Martin, Reinscke, and Küstner. After a careful review of the few recorded cases, Findley concludes that arterio-sclerosis, *per se*, is not an adequate cause of uterine hemorrhage. In all the reported cases there were other conditions which had resulted in obstruction to the general circulation, such as Bright's disease, heart lesions, pulmonary infection, and thrombosis of the uterine vessels. In the case recorded by Findley arterio-sclerosis and calcification of the uterine vessels undoubtedly existed long before the beginning of the hemorrhage. In this case embolic infarction of the uterus from a thrombus in the heart was the immediate cause of hemorrhage.[1] See Chronic Metritis.

Extra-uterine Inflammations, such as ovaritis, salpingitis, parametritis, and perimetritis, give rise to pelvic congestion and to a consequent effort of nature to obtain relief by an increased flow. Ovaritis, according to its nature, may increase or diminish menstruation. Parenchymatous inflammation in the cortical substance of the ovary may increase the flow. On the contrary, the atrophic process of interstitial ovaritis or of microcystic degeneration of the ovary, tends to induce amenorrhœa.

2. Tumors. Uterine tumors cause excessive menstruation in greater or less degree according to their situation. A growth beginning in close relation with the endometrium and developing within the uterine cavity may set up a dangerous periodical or constant bleeding; if situated in the uterine wall, between the endometrium and the perimetrium, it may excite little more than the normal flow; located near the peritoneal covering, it may, especially if pedunculated, give rise to no menstrual excess whatever: uterine myoma, for example, may, according as it is submucous, intramural, or subperitoneal, cause much, little, or no menorrhagia. See Chapter XXVI.

A tumor may set up excessive flow in one or both of two ways: 1. The irritation of its presence may give rise to a hemorrhagic endometritis. 2. Ulcerative processes or friability of the tumor itself may cause rupture of bloodvessels and hemorrhage. In one way, the blood comes from the endometrium; in the other, from the tumor. Myomata, being slow to ulcerate and break down, are little liable to bleed *per se;* but if submucous, they irritate the endometrium and set up hemorrhagic endometritis. Cancer and sarcoma not only cause hemorrhagic endometritis, but themselves rapidly undergo necrotic changes, and thus become the source of hemorrhage. Extra-uterine growths may induce menorrhagia by the pelvic irritation and consequent congestion to which they give rise.

3. Displacements. Deviations of the uterus and its appendages, through traction on the pelvic bloodvessels, may so obstruct the circulation as to cause venous congestion and a consequent excessive menstrual effort to lessen the quantity of blood in the pelvis. The complete relief from menorrhagia that sometimes follows the correction of a prolapsed or flexed uterus by means of artificial support,

[1] Arterio-sclerosis of the uterus. Findley. American Journal of Obstetrics, vol. xliii., No. 1, 1901.

and the prompt return of excessive menstruation upon the withdrawal of the support, are satisfactory proof that displacement may cause menorrhagia. Further information on this subject may be found in Part V., on Displacements.

4. Foreign Bodies. Tents and other foreign bodies which find their way into the uterus either from therapeutic or criminal motives may, by their irritating presence, cause excessive flow. An embryo detached in the course of abortion is a familiar example of foreign body in the uterus.

5. Systemic Disorders.[1] Any general disorder that will embarrass the return flow of blood from the pelvic viscera will cause an increased vascular pressure that may result in hemorrhage from the uterus. Among the systemic conditions that may underlie excessive menstruation are: hemorrhagic diathesis, scorbutus, purpura, malaria, lead-poisoning, and acute infectious diseases such as scarlet fever, diphtheria, and typhoid fever. Menorrhagia associated with such causes is often difficult to treat, because, as Croom says, these causes interact in such a way as to form a vicious circle—the drain on the system from the hemorrhage tending to aggravate the systemic condition, which in its turn leads to the menorrhagia. Chronic mental depression, hysteria, sedentary habits, and residence in high altitudes or the tropics, all, in greater or less degree, dispose to menorrhagia. In some cases anæmia, although usually a cause of amenorrhœa or scanty menstruation, may cause uterine hemorrhage. This is explained possibly by the low specific gravity, the diminished coagulability of the blood, or faulty nutrition of the vessels.

6. Visceral Diseases. Heart diseases, such as hypertrophy, dilatation, mitral insufficiency, or stenosis, as well as cirrhotic changes in the liver or kidney, are associated usually with such organic change or functional disturbance in the bloodvessels as to cause embarrassment of circulation and hemorrhage in various organs. Under one or more of the disorders just named, the uterus, being the seat of a normal periodic hemorrhage, and being therefore predisposed to hemorrhage, may, especially if there be disease of the endometrium, readily become the medium of exaggerated menstruation.

7. Uterine Moles. Among the occasional causes of uterine hemorrhage may be mentioned uterine moles. There are two varieties: 1, fleshy mole; 2, hydatiform mole, sometimes called *cystic mole*, and sometimes wrongly called *uterine hydatids*.

Fleshy Mole. The so-called fleshy mole is associated sometimes with hemorrhage from the uterus, and when so associated gives rise to abnormal signs of pregnancy. It may be recognized upon spontaneous expulsion or removal.

Hydatiform mole is the result of cystic degeneration of the chorionic villi. It gives rise to pronounced and constant or almost constant hemorrhage, and is associated with rapid increase in the size of the uterus, together with the usual signs of pregnancy. The diagnosis will depend upon the expulsion of a part or all of the vesicles. Although hydatiform mole and hydatids (echinococcus) resemble one

[1] Croom: System of Gynecology, Allbutt and Playfair.

another in gross appearance, they have no other characteristic in common. Uterine hydatids (echinococcus) have been observed, but they are of very rare occurrence.

When the causes of menorrhagia are so obscure that they cannot be detected, the hemorrhage has been termed idiopathic. The use of such a term explains nothing. It is better to say outright that the symptom is of unknown origin.

Diagnosis.

Before deciding what constitutes an excessive loss of blood, it is necessary to adopt at least an approximate standard of the normal amount. As already stated in the chapter on scanty menstruation, menorrhagia is a relative condition. An anæmic woman whose blood is scarcely sufficient to meet the fixed requirements of nutrition can ill afford to spare what, in a robust state, would be even less than normal; and, for such a woman, amenorrhœa may be a means of saving much needed blood, and in a relative sense, therefore, may be considered normal. On the other hand, in an exceptional case of plethora, eight or nine days of free menstruation may cause no ill-effect—may, indeed, be beneficial, and therefore normal. We may, however, for practical purposes arbitrarily limit the normal duration of menstruation to six days, and the number of napkins soiled in that time to about fifteen.

In the diagnosis of menorrhagia, one must exclude all bleeding from extra-uterine sources, such as the bleeding from hemorrhagic vulvo-vaginitis, from traumatism of the vulva or vagina, and from varicose veins of the vulva.

The mere discovery of menorrhagia is only the recognition of a symptom. The practical diagnosis includes as well the discovery of the cause or causes of that symptom. Only in this way is a rational prognosis or effective plan of treatment made possible. The causes that produce menorrhagia, and that have already in a general way been outlined in previous paragraphs of this chapter, will be found more fully discussed in the other chapters that specially treat of them.

The diagnosis of menorrhagia will vary according to the age of the patient somewhat as follows:

The Menorrhagia of Girls. Inasmuch as the menorrhagia of girls and of very young unmarried women is in a very large proportion of cases due to general systemic conditions, it is obvious that uterine examinations in such cases should at first be avoided. If the general examination has failed to disclose the causative lesion, or general treatment has failed to give relief, a pelvic examination may be the only means of diagnosis, and therefore may be imperative. It does not, however, by any means follow that local disease, even though coexistent with menorrhagia, should be made the occasion of local treatment. Such treatment may do great harm and no good. A case in point may be cited from the writer's experience. In this case there were coexisting menorrhagia and endometritis, and both promptly disap-

peared upon correction of a lateral curvature in the lumbar region of the spine. The endometritis and hemorrhage were probably both due to faulty general nutrition, and this in turn was perpetuated by the curvature.

Uterine hemorrhage during the period of maturity is, in a majority of cases, dependent solely or partly upon local pelvic disease such as infection, displacements, tumors, and products of conception. Very commonly the local disease coexists with general disorders. Such cases frequently demand local, general, or operative treatment.

Uterine Hemorrhage during the Menopause. To avoid repetition, the reader is referred to a partial discussion of the subject in Chapter I. If the menopause is characterized by a long-continued series of hemorrhages or by constant hemorrhage, the probability is that endometritis, inflammation of the uterine appendages, or a tumor exists, and retards the atrophic process and consequent normal amenorrhœa which at this time should take place. It may be laid down as a general proposition, moreover, that an abnormal menopause, even though not hemorrhagic, is a positive indication for thorough examination, both local and general, with a view to accurate and adequate diagnosis. This indication is strengthened by the frequent development, during this critical period, of malignant disease and mental disorder.

Treatment.

The foregoing paragraphs on etiology and diagnosis, when considered in their relations to treatment, should lead to the following general statement, to which, however, numerous exceptions will arise:

The treatment of uterine hemorrhage in girls and young women is often that of a systemic cause; the treatment in married women of the childbearing age is usually that of endometritis, benign tumors, or displacements; the treatment of the menorrhagia of spinsters is commonly that of benign tumors; and of women between the ages of forty and fifty years, often that of malignant growths or myomata; the treatment during senility is often that of malignant disease.

The therapeutic measures most frequently employed comprise:

1. Systemic treatment.
2. Local treatment.
3. Electrotherapeutics.
4. Surgical operations.

1. Systemic Treatment. Rest in bed during the most excessive part of the flow, freedom from mental disturbance, bathing, passive exercise, the use of nutritious, non-irritating food, the avoidance of stimulants, and residence in a temperate or cold climate at or near the sea-level, are the principal hygienic measures. Drugs, such as salines, ergot, digitalis, cinnamon, and hydrastis canadensis, may be selected according to special indications.

2. Local Treatment. The hot-water vaginal douche and vaginal and uterine tamponade, as described in Chapters IV. and XXVII., are the two most satisfactory means of local treatment. The latter, especially as a temporary measure, is, if properly applied, most effec-

tive. Intra-uterine injections of strong astringents, such as concentrated solutions of iodine and tincture of iron, are used frequently, and may in some cases be promptly effective; but the liability of setting up painful uterine contractions and the danger of invasion of the Fallopian tube and of possible pelvic infection, are serious objections to their general use.

3. Electrotherapeutics. The subject of electrotherapeutics has already been mentioned in the treatment of endometritis and myoma. Chapters XVII. and XVIII. The value of it has been much overestimated.

4. Surgical Operations. The operative treatment is usually not directly that of the mere symptom, hemorrhage; but rather of such diseases as endometritis, metritis, myoma, cancer, and sarcoma. The surgery of these diseases may be found discussed in other parts of the book.

METRORRHAGIA.

Metrorrhagia has already been defined as a non-menstrual uterine hemorrhage taking place in the interval between the end of one monthly period and the beginning of the next. As has been explained, it is associated not infrequently with menorrhagia, and cannot always be separated from it. The causes and treatment are the same as those of menorrhagia.

CHAPTER LIII.

DYSMENORRHŒA AND PERIODIC INTERMENSTRUAL PAIN.

DYSMENORRHŒA.

Definition and Classification.

DYSMENORRHŒA is painful menstruation. This definition does not include the slight heaviness in the loins, the general *malaise*, the vague sense of discomfort, and the irritability that go to make up "the unwell feeling" of healthy women during the menstrual week. The slight "unwell symptoms" so-called, although sometimes absent in normal cases, are not evidences of disease, and may therefore be disregarded.

The numerous attempts to classify dysmenorrhœa have led to the use of a complicated and abundant nomenclature, of which each term is taken to designate a particular variety of painful menstruation. Dysmenorrhœa has accordingly been variously characterized as tubal, ovarian, membranous, inflammatory, congestive, neuralgic, spasmodic, intermenstrual, mechanical, or constitutional. Such designations, although useful for purposes of description, are, when considered from the standpoint of classification, wholly misleading. The morbid conditions, associated with painful menstruation are to a considerable extent common to most of the so-called varieties. For example, dysmenorrhœa of inflammatory causation might originate in the ovary, tube, or uterus. It would necessarily be associated with congestion, it might take place in the intermenstrual period, or might be aggravated by causes of a mechanical or constitutional nature. Almost any one of the above names, therefore, might with equal propriety be applied to designate this so-called variety. The other terms proposed to designate special varieties are subject to similar criticism. Furthermore, the difficulty—not to say impossibility—of making in the present state of our knowledge a scientific or practical classification of dysmenorrhœa will become even more apparent from what follows.

Clinical History and Diagnosis.

Degrees of Pain. Pain associated with menstruation varies in the widest limits from the general *malaise* of the "unwell week" to the most intense agony. In many cases the pain is associated with definite lesions, and upon the cure of those lesions disappears. In other cases the suffering is wholly out of proportion to the associated disease—that is, a woman presenting the most exaggerated evidence of pain may upon careful examination disclose little or no disease to account for it; on the other hand, extensive disease may exist and yet give rise to little or no dysmenorrhœa.

Character of Pain. It is usual in the taking of histories in gynecological practice to note the character of the pains, and to designate them by such words as distinct, sharp, dull, heavy, radiating, dragging, bearing-down, and labor-like. The maximum pain may be in the back, loins, or pelvis; it may be constant, intermittent, or remittent; it may come on or be most intense before or during menstruation; it may cease or may increase with the establishment of the flow; it may continue only during the first day or two, or may with varying degrees of intensity outlast the period.

Unfortunately, the conditions that determine the variation in the degree and character of the pain are, for the most part, not very definitely known. So far, however, as the conditions are known and have a practical clinical value they will be considered later.

The following four-fold statement relative to the phenomena of normal menstruation, if read in connection with Chapter I., will perhaps help the student to understand the variations of dysmenorrhœa.[1]

1. There is, in normal menstruation, a general premenstrual and menstrual congestion of the pelvic organs.
2. Ovulation is usually associated with menstruation, but is not an essential factor of it.
3. There are slight premenstrual enlargement and softening of the uterus associated with congestion and swelling of the mucosa, reaching their maximum, according to Herman, on the fourth day of the flow, and continuing for a short time after the bleeding stops.
4. The menstrual fluid is composed chiefly of blood, but with admixture of cast-off epithelial cells and lymph corpuscles.

In the absence of a scientific and adequate classification, one may consider dysmenorrhœa in its relations with certain associated lesions; these lesions are designated under two heads, as follows:

A. Local diseases, usually situated in the pelvis.

B. General diseases, usually faults of nutrition.

Painful menstruation may, in rarely exceptional instances, exist unassociated with any demonstrable lesion. In the vast majority of cases, however, careful examination and close analysis will disclose either a local or a systemic cause, or both combined.

A. Dysmemorrhœa Associated with Local Diseases.

The local diseases commonly associated with dysmenorrhœa are:

1. Inflammation.
2. Tumors.
3. Obstructions.
4. Malformations.

1. *Inflammation.*

Chronic Endometritis. The most pronounced type of dysmenorrhœa dependent upon inflammation is described in Chapter XVI., and is known as membranous dysmenorrhœa; it is due to an ex-

[1] Webster. Diseases of Women.

foliative endometritis, which results in the casting out, either complete or in shreds, of an entire membranous layer from the uterine mucosa. This exfoliation is consequent upon an intense interstitial endometritis which so modifies the superficial layer that the blood, not being able to pass through it, accumulates at some point behind and forcibly strips up a portion of it. There is then an effort of the uterus to expel the partially detached portion; and as this is forced toward the external os it strips off and drags after it the remaining undetached portion. The stripping off and expulsion through the narrow cervical canal of the entire layer are associated with very strong intermittent uterine contractions and consequent spasmodic pain of the most intense character. If the membrane is detached and cast off in shreds, the pain will be less severe; if it is cast off in minute particles, the pain may be very slight. Membranous dysmenorrhœa, therefore, for different individuals and at different times for the same individual may, according to the size of the exfoliated masses, be very slight or most intense.

Projections into the endometrium of granulation-tissue, the product of chronic endometritis, may stimulate the swollen irritable uterus to spasmodic contractions similar to those of membranous dysmenorrhœa, though usually less severe. See Chapter XVI.

Chronic Metritis. Dysmenorrhœa when associated with chronic metritis may be attributed to the presence of an abnormal amount of fibrous tissue; this tissue is so dense and unyielding that it prevents the normal premenstrual softening of the uterus and the widening of the uterine canal, and in this way, especially when the organ is congested, may exert painful pressure on the uterine nerves. Metritis does not necessarily cause dysmenorrhœa. The symptom may result from the complications of metritis, such as displacement, fixation, or stenosis of the uterus, inflammation of the uterine appendages, chronic cellulitis, chronic peritonitis, or some neurosis.

Chronic Salpingitis. No satisfactory explanation has been given of the severe dysmenorrhœa that sometimes accompanies salpingitis. Cases in which the tube is moderately distended with pus are usually more painful than those in which there is great distention. Moreover, severe salpingitis may exist, and yet give rise to no dysmenorrhœa. For further information on the subject the reader is referred to Chapters XXI. and XXII.

Chronic Ovaritis is almost inseparable from inflammation of other pelvic organs. Its influence therefore as a cause of dysmenorrhœa cannot be accurately estimated. Painful menstruation associated with ovaritis is often characterized by a period of premenstrual suffering variable in duration, by rather pronounced nervous symptoms, and by mammary tenderness. Ovarian pain is especially apt to radiate to the thighs and nates. Pain referred to the ovaries is common, and often exists in the absence of a demonstrable lesion in the ovary. Removal of the ovaries under such conditions seldom gives permanent relief.

2. *Tumors.*

The tumors most frequently associated with dysmenorrhœa are uterine myomata of the intramural, submucous, or intra-uterine variety. These tumors may, especially during the period of menstrual congestion, cause pain in the following ways:

1. An intra-uterine or intramural tumor may stimulate the uterus to attempt its expulsion by painful uterine contraction.
2. A tumor may by its weight produce displacement of the uterus and consequent painful menstruation.
3. A tumor, if it fills the pelvis, may produce pressure symptoms; and these symptoms may, owing to the menstrual congestion, be aggravated during the catamenia.

Displacements of the uterus as associated factors in dysmenorrhœa are further considered in Part V. In this connection the reader's attention is specially directed to the subject of anteflexion as laid down in Chapter XLVIII.

3. *Obstruction.*

Stenosis within the cervical canal, and consequent obstruction to the outflow of blood, have held a large place in the controversial literature of dysmenorrhœa. The claimants for the mechanical theory, on the one hand, have sometimes attributed all, or nearly all, painful menstruation to narrowing of the uterine canal; while their opponents have not infrequently altogether denied to this cause any considerable place in the causation of dysmenorrhœa. It may be sufficient, without going over the arguments for and against the mechanical theory of dysmenorrhœa, to say that contraction of the cervical canal has properly been almost excluded as a direct mechanical cause of dysmenorrhœa. The following paragraph will show, however, that this exclusion does not by any means dispose of mechanical obstruction as a frequent indirect cause of painful menstruation.

Two forms of obstruction may be due to anteflexion. One is obstruction in the uterine canal, and is due to collapse and sometimes stenosis of the uterine canal at the point of bending; the other is obstruction in the bloodvessels, and is due to collapse of the walls of the vessels also at the point of bending. Either form may give rise to obstructive dysmenorrhœa: the one, less frequently in the uterine canal; the other, more frequently and more severely in the collapsed and obstructed bloodvessels of the flexed uterine walls.

Some authorities deny that dysmenorrhœa when associated with flexion is in any sense due to obstruction either in the uterine canal or in the vessels; they attribute the pain wholly to the associated uterine or extra-uterine inflammation. It is true that inflammation in a sense causes the pain; but it is also true that it causes the flexure, and that the flexure, once formed, tends to keep up the inflammation. The two together constitute what has been called a vicious circle; the former producing the latter, and the latter reacting to aggravate and perpetuate the former. A more full statement of the two forms of obstruction may be found in Chapter XLVIII.

4. *Malformations.*

Malformations of the pelvic organs may be associated with dysmenorrhœa in the following way: there may be atresia somewhere in the genital tract, with consequent retention of menstrual fluid, so that during successive periods the blood accumulates with steadily increasing and painful distention.

B. Dysmenorrhœa Associated with General Diseases.

The strong surgical bias in gynecological practice, emphasized by the remarkable results that have been obtained by operative and mechanical measures, and by the relative safety of such measures when aseptically employed, has led, during the last generation, to an undue estimate of the value of surgical procedures, and to a corresponding neglect of general therapeutic requirements. Accordingly, there has been during the past thirty years a strong movement along surgical and mechanical lines, and a corresponding disposition to disregard the claims of internal medicine. To ignore extrapelvic causes of pelvic pain or to disregard pelvic causes of systemic disturbances would be manifestly absurd. In either case most embarrassing blunders in diagnosis and treatment would necessarily follow.

Many constitutional and systemic conditions predispose to painful menstruation; they may be associated with dysmenorrhœa with or without demonstrable local lesions. In some cases in which local disease is not present, or, if present, is not sufficient to account for the menstrual pain, the dysmenorrrhœa must be chiefly or wholly attributed to general causes. Among the general disorders often associated with dysmenorrhœa are rheumatism, gout, anæmia, chlorosis, malaria, neurasthenia, and hysteria. What Goodell aptly called the intangible, imponderable, invisible pelvic pains of neurotic women are especially liable to increase during menstruation.

In one pronounced class of cases the reproductive organs may, from lack of proper innervation and nutrition, have failed to mature at the age of puberty, and may therefore perform the menstrual function imperfectly; the defect declares itself not infrequently in the form of an intensely painful effort to menstruate—that is, a painful molimen with little or no flow. The lack of innervation and nutrition in such cases is not often confined to the pelvic organs; it is usually systemic. Dysmenorrhœa of this kind, therefore, has both a systemic and a local source.

Among the neuroses most frequently associated with dysmenorrhœa are neurasthenia and hysteria; the one, characterized by excessive hyperæsthesia and involving motor weakness; the other, characterized by loss of power and coördination over automatic movements and by an excessive responsiveness to suggestion. Either of these neuroses may coexist with dysmenorrhœa in cases that present no local disease, or local disease so slight that in an otherwise normal woman, it would have little or no recognition.

Dysmenorrhœa Associated with Menstrual Reflexes.[1]

Relation of Nose to Genital Organs. The assertion made by Fliess, in 1897, of a close relationship between the nasal mucous membrane and the genital organs in woman, seems to be fully confirmed by Schiff,[2] of Vienna, who undertook in skeptical spirit the investigation of this subject. It will be remembered that Fliess found "genital spots" on the inferior turbinated and on the nasal septum, which showed swelling, congestion, and sensitiveness during menstruation. In cases of dysmenorrhœa it was found possible to prevent the pains in the abdomen and loins by applying cocaine to the nasal "spots," and, indeed, entirely to cure these symptoms by cauterization of this nasal region. Schiff reports that in 41 cases of severe dysmenorrhœa positive results were obtained in 35 cases, and the findings in some instances showed that treatment of the tubercula septi favorably influenced pains in the loins, and treatment of the inferior turbinated affected pains in the hypochondrium. Of these cases, 17 were cauterized later nasally by trichloracetic acid or bipolar electrolysis, and complete cures obtained in 12. Three women who were great sufferers previously have remained quite free from menstrual pain for one and a half to two and a half years. Treatment with cocaine consists in the application of 2 drops of a 20 per cent. solution on cotton applied through a speculum.

Mechanical dysmenorrhœa—that is, where the pain stops after the flow is established—is not denied by Schiff; but in all cases in which the discomforts persist, cocaine treatment should be attempted and good results may be expected.

The question of menstrual nasal reflexes was discussed at great length at the July meeting of the Leipzig Gesellschaft für Geburtshülfe. Windscheid[3] dwelt on the vagueness of the so-called genital reflexes, the main point of his argument being that the reflex nature of many disturbances attributed to genital conditions was entirely without proof. Heymann asserted that the nose is peculiarly a reflex organ. The bloodvessels and its mucous membrane receive the dilator nerve fibres directly from the medulla by way of the trigeminus and the sympathetic nerves. The well-known vicarious epistaxis of amenorrhœa is sufficient to prove the relationship between the genital organs and the nose.

Krönig went most thoroughly over the ground of dysmenorrhœa in its relation to nasal reflex neurosis. He thinks that in some cases of dysmenorrhœa there are no objective pathologic findings, and that we must look to the nervous system for the explanation of such conditions even when hysteria or other neuroses are apparently not present. He thinks that mental suggestion is not responsible for the cure of dysmenorrhœa by nasal treatment, because Schiff carefully undertook to rule out that factor. He has had experience with 8 cases which he observed carefully for a considerable period, and these fully confirm the findings of Fliess and Schiff. The effect of the cocaine after

[1] From the Practical Medical Series. Head.
[2] Wiener klinische Wochenschr., 1901, No. 3.
[3] Centralbl. f. Gynäkologie, 1901, No. 48.

the first treatment appears to be less pronounced. The pains in the pelvis and loins always disappear, but sometimes the headache and lack of appetite remain.

The amenorrhœa of post-pubertal life has been investigated by Koblank.[1] He finds onanism of etiologic moment. He has lately observed 35 cases in which this seemed to be the direct cause. He maintains that positive signs of onanism were found in painful hypertrophy of the left lobe of the thyroid gland and swelling of certain parts of the nasal mucous membrane. For the cure of amenorrhœa of this type he proposes to cauterize the nose, and reports 8 cases with 5 successes.

Treatment.

There are two possible errors that may be made in connection with treatment. One is that a distinct nervous or other general disorder closely related to the causation of the pain may be overlooked or neglected; the other is that exaggerated importance may be given to some insignificant local lesion, that this exaggeration may result in an error of judgment, and that much local treatment of what is known as the tinkering kind may be adopted or that unnecessary operations may be performed. Of course, the opposite mistake may be made—that is, unnecessary general treatment may be employed to the exclusion of necessary local or surgical treatment.[2]

The treatment of dysmenorrhœa, like the cause, is either local or general, or both.

Local Treatment. The term local treatment here used is extended beyond the usual meaning, and includes both non-surgical and surgical measures. These measures are described in various chapters of this book.

The **General Treatment** is that of the constitutional and systemic conditions already outlined among the possible causes of painful menstruation. The subject is almost coextensive with the whole field of general internal medicine, and cannot therefore adequately be discussed within the limits of a gynecological treatise.

PERIODIC INTERMENSTRUAL PAIN.

(German, *Mittelschmerz.*)

Periodic pain, resembling the pain of obstructive dysmenorrhœa, recurring regularly with each intermenstrual period, and continuing for a definite time, is a condition that often defies analysis and treatment. All explanations of this phenomenon are more or less speculative. The two most rational theories are that the pain is caused by:

1. Sclerosis and contraction of the ovary.
2. Salpingitis profluens.

1. Sclerosis and Contraction of the Ovary. Hyperplastic thickening and toughening of the superficial structure covering the

[1] Zeitsch. f. Geburts. u. Gynäk., Bd. xliii. Hft. 3.
[2] Adaptation from W. S. Playfair, in a System of Gynecology.

Graafian follicles may offer such resistance to the bursting of mature follicles as to cause pain. It is urged that there is no periodicity in the maturing and bursting of the follicles, and that the sclerosis therefore, while it might account for the pain, could not account for the periodicity of it; a speculative reply to this objection would be that ovulation from some unexplained cause, perhaps reversion to a former type, may in rare instances preserve a regular periodicity, and that in such exceptional cases sclerotic toughening would account for the periodic intermenstrual pain.

The writer once removed a sclerotic right ovary and tube, with entire relief to the patient, from a most excruciating *Mittelschmerz* that had for a long time resisted all other treatment. The relief, however, continued only through the two periods immediately following the operation. The pain at the time of the third and fourth periods recurred, and was nearly as severe as before; but since the fourth period there has been almost entire relief.

2. Salpingitis Profluens. In numerous instances intermenstrual pain of long standing has disappeared permanently upon the removal of leaky Fallopian tubes—hydrosalpinx or pyosalpinx. The periodicity of the pain in cases of this class is explained by the assertion that a certain definite number of days after each menstruation would be required for the tube to fill with secretions, and that being filled it discharges its contents with regularly recurring pains. There is no evidence in these cases to show absence of cirrhosis of the ovary, hence the cause of the pain may have been ovarian and not tubal.

CHAPTER LIV.

STERILITY.

Definition.

EXCLUDING the physiological sterility of infancy and senility, one may define sterility as the inability of the individual to produce offspring. In a broad sense, a woman is sterile who cannot become pregnant, or, if pregnant, cannot produce a viable child. A man is sterile who cannot produce semen that will fertilize an ovum. In a narrow sense, a woman who can conceive and imbed the ovum in the endometrium should not, if the ovum then dies and is cast off, be classed as sterile. The condition, strictly speaking, would be not one of sterility, but of abortion. From the clinical standpoint, however, such early abortion is not easily separable from sterility, for habitual abortion may occur very early in pregnancy—so early that the pregnancy could not have been recognized. Sterility in the male, except as it may have a gynecological significance in diagnosis or prognosis, will not be discussed.

Statistics.

Pathological sterility, as distinguished from the physiological sterility of infancy and senility, is properly confined to the years between the end of puberty and the beginning of the menopause—that is, to the period of maturity; in the majority of cases the limits are even more confined, for the capacity to bear children is seldom fully developed until three or four years after puberty, and it generally ceases some years before the menopause. Failure to bear children therefore in the early years of maturity or in the late years of the menopause, even though it might indicate lateness in the development of sexual vigor or premature decadence, should not be considered pathological, and for this reason it should not enter into the statistics.

It is said that 10 or 12 per cent. of all marriages are sterile; this, however, is not an index to the frequency of female sterility. One must also reckon with the fact of male sterility. The proportion of cases in which the fault is in the male has never been the subject of thorough investigation, but the estimates range from 7 to 40 per cent. The percentage is undoubtedly very large, and has greatly added to the popular estimate of female sterility.

Classification.

The varieties of sterility, according to the causes or associated conditions, have been designated as follows:

1. Complete or absolute sterility.
2. Incomplete or contingent sterility.

Some authors have made a further classification of congenital and

acquired sterility; these varieties, however, are only subdivisions of complete and contingent sterility, and should therefore be considered with them.

1. **Absolute or Complete Sterility.** Sterility is absolute when due to congenital defects, or disease, or surgical operations that render the generative organs permanently incapable of performing their reproductive functions. The organs may be congenitally defective or absent, or may be impotent from disease, or may have been removed by surgery.

2. **Relative or Partial Sterility.** Sterility is relative or partial when, on account of some defect in development or nutrition, the functions of the reproductive organs are inadequately performed. The condition may be only temporary, and may disappear upon improvement of the general health or upon the removal of some obstruction or disease in the genital tract. To this class belong cases of pregnancy occurring after years of sterile marriage. Some observers designate as relative only that variety in which, on account of sexual or other defects, such as marital or mental incompatibility, a man and woman are unable to act together in reproduction. In such cases each may immediately become fruitful after a second marriage. The question would then be, not whether the individuals are positively sterile, but rather, what is the explanation of the sterile union between them. Investigation would usually show that the failure was due rather to anatomical or physiological defects than to mere incompatibility. Moreover, the ovum of a sexually defective woman, although not impregnable by a defective man, might, when brought in contact with the semen of a normal man, readily become fertilized; and *vice versa*, the semen of a defective man might fertilize the ovum of a normal woman.

Etiology.

A knowledge of the mechanism of conception is essential to an appreciation of the causes of sterility. A large portion of the cortical substance of the ovary is occupied by Graafian follicles in all periods of growth; each follicle contains a fluid, called liquor folliculi, and the ovum. As the follicle and its contained ovum mature the former gradually becomes distended with the fluid, appears beneath the surface, ruptures, and discharges its contents. The ovum is now washed out into the pelvic cavity, and under normal conditions reaches the Fallopian tube and passes along the tube toward the uterus. If at this time, under normal conditions, coitus takes place, and seminal fluid containing virile spermatozoa is deposited in the upper part of the vagina, the spermatozoa, of their own power of movement, enter the endometrium and work their way upward along the genital tract toward the descending ovum. The exact meeting-place of the two organisms is not known. There is strong reason to infer that it is in the Fallopian tube, perhaps at the abdominal end, and that the persistent and virile spermatozoa may consume several days in traversing the long distance; they have been observed at the abdominal end of the tube as late as five weeks after the last sexual intercourse

There are two necessary conditions for normal conception: one, that the ovum as it passes down the genital tract shall meet the spermatozoa, and by them become fertilized; the other, that the fertilized ovum shall find in the endometrium a place favorable to further development, and there become imbedded. If by reason of any defect, general or local, either one of these conditions be absent, conception is impossible. The ovum, failing to reach the tube, may be destroyed in the peritoneal cavity; or, having reached it, may pass down the genital tract and fail to be fertilized. The spermatozoa may not be sufficiently virile to find their way upward from the vagina; or, if they reach the ovum, they may not be able to fertilize it. The two organisms may succumb to hostile environment or to some anatomical defect that will obstruct their movements. As indicated in the foregoing, a sterile marriage may result from:

1. Absence of virile spermatozoa.
2. Faulty general nutrition in the woman.
3. Defective reproductive organs in the woman.
4. Intermediate causes.

1. The Absence of Virile Spermatozoa.

Old age, wasting diseases, congenital defects, and venereal diseases (especially gonorrhœa) may incapacitate the man to produce virile spermatozoa or may entirely destroy the procreative power. Many a woman has suffered useless—not to say injurious—treatment for supposed sterility when the fault was entirely with the husband. An examination of the husband's reproductive organs, including microscopic examination of the semen, may disclose orchitis, stricture of the urethra, hypospadias, or some other defect that may adequately account for the sterile marriage. A careful inquiry should be made also into the man's general condition. Tuberculosis is a not infrequent cause of sterility.

2. Faulty General Nutrition in the Woman.

Chronic wasting diseases and such nutritional disturbances as chlorosis and anæmia, and, above all, the accumulation of fat, especially the peculiar adiposity of anæmic women, due to faulty metabolism, but giving the false appearance of plethora, may lead to sterility. Enteric fever, scarlatina, cholera, variola, diabetes, and nephritis are among the diseases frequently associated with sterility. Premature menopause—that is, permanent atrophy of the reproductive organs and consequent sterility—may result from acute infectious disease. See Non-puerperal Atrophy, Chapter XVIII.

3. Defective Reproductive Organs in the Woman.

Defects in the reproductive organs, both congenital and acquired, may, according to their nature, give rise to the two varieties of sterility designated as complete and incomplete.

Congenital Defects in the Reproductive Organs Causing Complete or Absolute Sterility.

1. Absence of the ovaries, Fallopian tubes, or uterus.
2. Rudimentary ovaries, Fallopian tubes, or uterus.
3. Inoperable atresia in the genital tract.

Congenital Defects in the Reproductive Organs Causing Incomplete or Contingent Sterility.

1. Immaturity or innutrition of the ovaries, Fallopian tubes, or uterus.
2. Stenosis or atresia in the genital tract, as in the cervix uteri, vagina, or vulva; infantile vulva; abnormal backward location of the vulva.
3. Opening of the vagina into the bladder or rectum or double vagina, preventing coition.
4. Displacements, especially flexures.
5. Elongation, shortening, or conical shape, and other irregular developments of the cervix uteri. This includes lengthening of one lip of the cervix uteri, so as to form a flap over the os uteri externum.
6. Imperforate hymen or cribriform hymen, transverse vaginal septum.
7. Excessive convolutions or increased length of the Fallopian tubes.
8. Double uterus.
9. Gynandry.

Discussion of Congenital Causes.

For a more extended description of congenital defects the student is referred to Chapters XXXVII. and XXXVIII., on Congenital Malformations and Gynatresia.

A rudimentary condition or absence of the ovary may coexist with a well-developed uterus, and *vice versa;* either combination is a cause of complete sterility. Absence of one ovary, if the other is normal or approximately normal, is not necessarily a cause of sterility.

Septate or double vagina, with the septum so disposed as to divide the vagina into unequal parts, may permit impregnation if the larger part is capable of coition. The smaller part may only serve for menstruation. One side of a double uterus adequately developed may receive the impregnated ovum and carry it to maturity.

Absence or impermeability of both Fallopian tubes, unless they can be surgically opened, causes complete or absolute sterility; this defect, however, is usually associated with absent or rudimentary uterus. Unicorn uterus permits normal pregnancy, utero-gestation, and parturition. Immaturity and innutrition of the ovaries, rendering them incapable of producing mature ova, are generally associated with some defect in the general systemic development. Rare instances have been reported in which the reproductive organs, seemingly undeveloped at the age of puberty, have later developed and become fruitful.

Acquired Defects in the Reproductive Organs Causing Complete or Absolute Sterility.

1. Surgical removal of the uterus, Fallopian tubes, or ovaries.
2. Permanent atrophy of the uterus or ovaries.
3. Permanent and incurable occlusion of the Fallopian tubes or uterus.
4. Complete destruction from disease of the functionating part (cortical substance) of the ovary and microcystic degeneration of the ovary.

Acquired Defects in the Reproductive Organs Causing Incomplete or Contingent Sterility.

The acquired defects that may produce incomplete sterility are so numerous and varied, so interactive and complicated, that they sometimes defy analysis; they may be generally designated as follows:

1. Inflammation in the genital tract and its results, such as displacements, adhesions, pathological secretions, stenosis, atresia, kinking of the Fallopian tubes, tuberculosis and syphilis of the genital tract, hypertrophy and hyperplasia, atrophic changes, microcystic degeneration of the ovaries, and mechanical conditions.
2. Tumors of the generative organs, and the organic and mechanical changes that the tumors produce.
3. Faulty innervation and innutrition of the organs of reproduction. Vaginismus and pruritus vulvæ are possible examples.

Discussion of Acquired Sterility.

Surgical Operations. The surgical removal of one ovary or Fallopian tube does not cause sterility; if both are removed, sterility is absolute; if a small part of one ovary remains, pregnancy may occur. The removal of both tubes would not necessarily cause sterility. Pregnancy has followed the removal of both tubes by ligature placed close to the uterus; in these cases, the ligatured stump having sloughed off, the extreme uterine end of the tube remained sufficiently open to transmit the ovum. Excision of the uterine ends of the tubes and union of the peritoneal surfaces over the wounds in both uterine cornua would cause absolute sterility. Pregnancy may occur in a uterus of which a part has been removed, especially the cervical part. Even considerable portions of the wall of the corpus, as in myomectomy, may be sacrificed without causing absolute sterility. There is a recognized persistence in the ovaries, tubes, and uterus that sometimes enables them, even though mutilated and mostly destroyed, to perform the reproductive functions. Numerous conservative operations, therefore, designed to preserve in whole or in part the uterus and its appendages, have been substituted for the radical operation of removal. See Myomectomy, Salpingo-stomatomie, Resection of the Ovary, and Vaginal Incision and Drainage.

Inflammatory disorders of the uterus, Fallopian tubes, or ovaries are

associated with a great majority of cases of acquired sterility. Ovaritis may result in atrophy or other organic changes that will render the ovary sterile or incapable of producing mature ova. Atrophy of the ovaries, general or acquired, may or may not be associated with atrophy of the uterus.

Salpingitis may set up thickening, adhesions, kinking, stenosis, or atresia of the tube, and in this way may impede the ovum in its passage to the uterus or pathological secretions may destroy it. Inflammatory thickening of the muscular layer may embarrass the tube in passing the ovum toward the uterus. Endosalpingitis may destroy the cilia of the tubal epithelium, so that they cannot aid in the transmission of the ovum. Catarrhal salpingitis may cause temporary obstruction of the tube, from swelling of the mucosa.

Endometritis may produce a pathological secretion so abundant and so hostile to the impregnated ovum as to prevent implantation—may even destroy it and sweep it out of the uterus; or, if imbedding take place, the ovum may be unable to survive the hostile environment.

Sterility caused by gonorrhœal or syphilitic salpingitis and endometritis may be relative or absolute; more frequently the latter. This is, perhaps, a wise provision of nature to limit reproduction in that direction.

Endocervicitis produces a cervical plug of gelatinous mucus that mechanically prevents the ingress of spermatozoa to the endometrium.

General metritis still further renders the uterus unfit for gestation.

Exfoliative endometritis (membranous dysmenorrhœa) generally causes complete sterility.

Pelvic peritonitis may cause obstruction of the tube by closure of the fimbriated extremity; or may so draw it aside by adhesions that for mechanical reasons it may fail to transmit the ovum.

Parametritis, except as it is apt to be associated with inflammation elsewhere, is not very significant.

Vaginitis may produce a hyperacid secretion that is hostile to the spermatozoa, and may induce incomplete sterility by cicatricial stenosis, and by adhesions of the vaginal portion of the cervix to the vaginal fornix, and by cicatricial shortening of the vagina. Vaginitis and vulvo-vaginitis prevent coition or render it painful and imperfect, and are therefore not infrequent causes of incomplete sterility.

Painful caruncle of the urethra and kraurosis vulvæ are other causes of dyspareunia and consequent incomplete sterility. The presence of urine in the vagina from a *vesico-vaginal fistula* would destroy spermatozoa, both by its own toxins and by the vaginitis that it would cause.

Atrophy of the uterus may be either concentric or excentric; both cause sterility, the former more positively than the latter. See Atrophy of the Uterus in chapter on Amenorrhœa. *Curettage* has occasionally been followed by atrophy of the uterus.

Tumors of the genital organs, by their mechanical effects or by their depressing systemic influence, may induce sterility; but they more commonly do so by the inflammatory or other organic changes they set up. The irritating presence of a uterine myoma causing endometritis, and the complete destruction of ovarian tissue by the

presence of an ovarian tumor, are familiar examples. One case has been reported of a woman who had given birth to twelve children, of whom the last was only three months old at the time of the removal of two dermoid ovaries. This case illustrates the fact that an ovarian cyst, although it may cause partial sterility, yet, unless it has destroyed the entire cortical substance of the ovary, does not cause complete sterility. The two signs ordinarily constant in atrophy of the ovary are decrease in size of the organ and amenorrhœa; in case of complicating ovarian tumor the former sign is reversed.

Displacements and stenosis of the uterus, especially flexions, are very commonly associated with incomplete sterility. It is highly probable that these lesions cause sterility rather from the endometritis, salpingitis, and perimetritis they set up, than from any direct influence they exert *per se*.

The above statement is especially true of pathological anteflexion and stenosis of the os uteri externum. Spermatozoa will pass through very minute openings, but catarrhal conditions above may destroy them. In sounding the uterus for the diagnosis of atresia or stenosis, care should be taken lest the sound, by catching in a fold of cervical mucosa, make the canal appear imperforate. It is also important to observe whether the sound passes on by pushing aside an unrecognized valve-like flap of mucosa, which, if left undisturbed, might make a complete obstruction.

4. Indeterminate Causes.

In some cases the reproductive function has always been absent, or is suspended or lost without discoverable cause. These cases occupy an indefinite ground between absolute and contingent sterility. To say that there is imperfect co-ordination between important organs involved, or that, owing to incompatibility, the husband and wife do not act together efficiently, in nowise accounts for the failure. Absence of orgasm on the part of the woman has in some cases been offered as an explanation; but there is abundant proof that, although it may have some influence, orgasm is by no means essential to impregnation.

Diagnosis, Prognosis, and Treatment.

The diagnosis, prognosis, and treatment of the symptom, sterility, necessarily conform to the various diseases that give rise to it; and are set forth at length in the preceding chapters that treat of those diseases. To these chapters the student is referred.

The diagnosis includes, first, a careful examination of the husband. If the fault lies with him, as it frequently does, the case is not gynecological, and should not be made the occasion for examination or treatment of the wife.

In examining the woman for sterility, it is usually necessary to make not only a careful conjoined examination of all the reproductive organs, but as well of the systemic condition. The local examination will generally include accurate measurements with the sound of the length and diameter of the uterine canal.

Prognosis. Disease associated with sterility may offer a favorable prognosis for anatomical cure, and even for the relief of pain and other annoying symptoms; such a result, however, does not always include successful pregnancy. The prognosis of sterility, therefore, does not necessarily conform to that of the associated lesions.

Treatment. The treatment is that of the associated lesions, and is in no respect modified by the fact that the object of treatment is impregnation. The indication will always be to secure an open genital tract, a normal state of the reproductive organs, and a good systemic condition. The treatment of sterility by mechanical aids to pregnancy, such as the transfer of seminal fluid from the vagina to the endometrium by injection immediately after intercourse, has been tried; the method, however, is both revolting and useless.

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